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ERIE CANAL TRADE.

Buffalo, Feb. 13.—Canal boatmen express much expectation of another paying season in the grain and other trades, as they find that the railroads are so little able to take care of the freight that naturally goes to them that they are not the competitors that they used to be. Both the grain and lumber trade here and at Tonawanda found the canal fleet much too small for their needs last season, so that it is with much satisfaction that they are able to report the prospect of a larger fleet for next season. It appears that business was so good last season that it attracted to the main line a number of boats from the Northern canal in the Lake Champlain district and it is now stated that the grain trade from here can count on about 100 boats from there next season.

'This, with 400 to 500 boats fit for grain owned on the main line, will make a very respectable fleet and one that will do much towards handling the fall lake cargoes, so many of which were cut off last season by the notice given out by the roads declining to take grain for a long time that was not contracted through from its western shipping point. As it was there were whole weeks that the canal carried more grain than was credited to the roads, the canal always moving its cargoes promptly and the roads oftener than otherwise in crowded times merely getting credit one week for what it actually takes out some weeks later.

But there need be no odious comparisons between the two classes of carriers. There is ample business for both and this is so apparent now to all that it is officially stated that there is no organized opposition to the enlargement of the canal. Boatmen say that the work of building the barge canal is in good hands and they believe it will be ready quite as soon

as the new fleet is ready for it. This, however, does not mean that it will be ready right away. In fact nobody is yet ready to say how many years the work will take.

But the speculation as to what it will mean to traffic is eager and confident. That it will save the lake grain trade and give a new impetus to the manufactured iron trade and also carry not a little ore is believed. A city lumberman predicts that he will some day be sending these 1,000-ton canal barges many hundred miles up and down the coast, both with and after cargoes. He will go to Norfolk, Va., for lumber and the out-trip will enable shippers to use the barges for manufactured products of the lake district.

All that is needed to attract the barges up and down the coast from New York is a paying cargo. Opponents of the canal enlargement used to say, as if they had settled the question, that the present canal was capable of carrying many times what it was carrying, which was true, but to carry freight at a profit, that was the only question of capacity that was worth discussing. As soon as that was no longer possible the canal was practically dead. But conditions have changed so rapidly in late years and in the direction opposite to the change that was once taking place that old calculations are all upset and the canal is once more a factor in traffic just as it is.

That the new fleet can traverse the coast and also cover lake Erie at least if it chooses is shown by the statement of a canal boatman made in a late conversation on the subject. He said that he once took two steam canal boats down the coast as far as Newberne, N. C., and carried cargoes in them. The barges will be much more capable of making such trips.

Again it is predicted that the Pan-

ma canal will make it possible to ship lumber from California and Washington to New York and at least as far as here by barge canal, with one transfer at New York and that it will cost less than it does to ship lumber here all-rail from the Pacific coast. There will certainly be need of the lumber by the time the Panama canal is finished. The lumber supply by lake is going to run down very fast from this time on.

There is much speculation as to the sort of fleet likely to be put on the enlarged canal, though it is pretty generally agreed that the individual boatmen will no longer be much of a factor there. The railroads or the heavy shippers or both will put fleets on and the shippers and the public will welcome them. The day of small interests in close connection with such large opportunities and large demands has gone forever. It would not be possible to recall the individual boatman to any great extent if it were desired, for he is mostly dead. The public is sorry that he could not wait to see the completion of the work he helped begin, but he well knew that he was not needed further. Such is the way of things. The great problem now is not how to cripple large interests, but to so control them that they do not become a menace to each other and to civilization and individual effort.

JOHN W. CHAMBERLIN.

The third turbine steamer to be built in this country, the Harvard, was launched recently by the Delaware River Iron Ship Building & Engine Co., Chester, Pa. She is a sister ship of the Yale, launched late last year, being for the Metropolitan Steamship Co. The Harvard is 407 ft. long, 63 ft. beam and 16 ft. draught. W. & A. Fletcher Co., Hoboken, will equip her with turbine engines.

THE WHITE STAR LINE SOUTHAMPTON TRANSFER OF MAIL STEAMERS.

The White Star Co. has authorized the announcement to be made that it has decided to transfer the Wednesday Royal Mail and passenger service from Liverpool to Southampton. It gives as its reason for taking this important step that it is not any shortcoming in connection with Liverpool docks or approaches, but simply and solely to meet the growing demand of travelers that facilities should be provided to enable them to embark and disembark at either a Continental or British port, thus obviating the necessity of crossing the English Channel. The leading German steamship companies have long recognized the desirability of meeting this demand. With this in view their New York steamers have been calling at both a British and French port, and there is no doubt that they have thereby been materially assisted in competing with the British lines for first-class passenger business—a business for which the competition is becoming keener every year. The transfer of the White Star mail service to the English Channel will result in one British company touching at a French port. The steamers allocated to the Southampton-Cherbourg route, and which will carry on the mail service, are the Oceanic, Majestic, Teutonic, and Adriatic. They will be dispatched from Southampton on Wednesdays, and will, after calling at Cherbourg, proceed to Queenstown, where, in order to carry out the company's obligation to the British post office, the ships will embark the mails, which will meet them on arrival, and having taken on board the Queenstown passengers, will sail at once for New York, avoiding the long detention at Queenstown to which they have hitherto been subjected. Returning, they will proceed direct from New York to Plymouth, thence to Cherbourg, and end the voyage at Southampton. The first departure will be that of the new palatial twin-screw steamer, Adriatic, now being completed at Belfast, the advent of which in the North Atlantic trade is awaited with so much interest. She will sail from Liverpool for New York via Queenstown on her maiden voyage on May 8, the Majestic, Oceanic, Teutonic following in the sequence named, and the regular weekly departure from Southampton will be inaugurated with the sailing of the Adriatic from that port on June 5. It must not be imagined from the foregoing that the White Star line has any idea of abandoning Liverpool, as it is its intention to still maintain a weekly sailing of passenger steamers from Liverpool to New York. This service will be maintained by the four magnificent modern twin-

screw steamers, Baltic, Cedric, Celtic and Arabic, three of which are the largest British steamers carrying passengers at the present time. In many years past the sailing day for this service has been Friday, and it has now been decided to change this to Thursday. The vessels will call at Queenstown both outwards and homeward as at present. The Liverpool-Boston, and all the other services from Liverpool will be continued as before. From the above it will be seen that while the White Star line is transferring four of its steamers to Southampton, it has no intention of seriously weakening its position at Liverpool; and the management intends to continue to afford every convenience and facility to passengers of all classes, and shippers and consignees.

In this connection it is significant and worthy of note that the Southampton Docks and Harbor Board have recently had under consideration plans from the London & Southwestern Railway Co. providing for the immediate construction of a new deep water dock. At low tide the new dock will contain 40 ft. of water, and will be the deepest artificial basin in Europe. The dock will be capable of accommodating four of the largest vessels afloat at one time at every state of the tide. The dock will be an open one without gates or locks with an entrance of some 300 ft. wide.

THE CUNARD LIKELY TO FOLLOW.

The Cunard Co. has made the official statement that, although the alteration of the sailings of the White Star Co. is not likely to make any change in the present program of the Cunard Co., the subject of making use of some English Channel ports was under consideration. The company states that it has been for quite a long time a subject of consideration with the directors of the Cunard Co. as to when they should avail themselves of the facilities offered by the southern ports, but here is their official statement: "It is, of course, indisputable that for the Continental first-class traffic those ports possess advantages with which Liverpool cannot compete, and sooner or later the directors of the Cunard Co. have concluded that they will have to make use of those advantages in the interests of their company. So far as some of their ships are concerned, the matter is possibly only one of time. Up to now it has suited the Cunard Co. to adhere entirely to Liverpool."

These announcements, it need hardly be said, have caused no little consternation in Liverpool shipping circles, and there can be no doubt that if both these services leave Liverpool, as it appears certain that they will, the move will prove a serious and heavy loss to Liverpool. But it seems to be the only alter-

native for these companies to adopt, unless they are prepared to allow the German lines to take from them the best part of the New York-Continental traffic as they are now doing. The White Star line has shown some enterprise in thus launching out for this traffic, and they will doubtless secure some of this trade, which was fast slipping away from the British lines.

PRESERVATION OF NIAGARA.

The recent decision of Secretary Taft on the Niagara Falls power question was manifestly drawn to conform completely in spirit as well as in words with the terms of the act passed by congress for the preservation of the falls. Following the testimony of Dr. Clark, New York state geologist, and information furnished by the International Waterways Commission, he ruled that the diversion of 13,000 cu. ft. a second from the Canadian side will not in any way affect the American falls, nor will the use of 15,600 cu. ft. on the American side have any appreciable effect on their appearance. He has accordingly issued permits to the Niagara Falls Power Co. for 8,600 cu. ft., to the Niagara Falls Hydraulic Power & Mfg. Co. for 6,500 cu. ft., and to parties along the Erie canal for 400 cu. ft. In addition he has granted permits to Canadian companies to transmit power to the United States as follows: International Railway Co., 1,500 H. P.; Ontario Power Co., 60,000 H. P.; Canadian Niagara Falls Power Co., 52,500 H. P.; Electrical Development Co., 46,000 H. P.; a total of 160,000 H. P. These permits are revocable at pleasure by the secretary of war and will expire on June 29, 1909, in the absence of further legislation by congress. The most important feature of the secretary's decision, as respects the beauty of the falls, is his determination to have the American side of the gorge below the falls cleaned up so as to lose its present resemblance to the back yard of a shiftless householder. Messrs. Charles F. McKim, Frank D. Millet and F. L. Olmsted are to be retained to advise the secretary what changes, at an expense not out of proportion to the extent of the investment, can be made to put the side of the gorge from the top to bottom in natural harmony with the falls and other surroundings, and conceal so far as possible the raw commercial aspect that now offends the eye. Compliance with the conditions which will be formulated after consultation with these specialists will be insisted upon in granting the permits. This decision is an excellent one, and

in the three years it covers plenty of time is afforded for a detailed study of the whole subject in a rational and calm manner, so that both the needs of industrial development and the preservation of the scenic grandeur of the locality shall have due consideration.

NAVY-BUILT VS. PRIVATE-BUILT WARSHIPS.

The reason why the government cannot build a battleship as cheaply as can private ship building concerns that furnish the navy with most of its fighting craft was explained recently by Edwin S. Cramp, vice president of the William Cramp & Sons Co., builders of ships of war. His talk on battleship construction was an outgrowth of the publication of a dispatch from Washington saying that Secretary Metcalf had made public a statement showing that the battleship Connecticut, built at the New York navy yard, cost just \$359,425 more than did the Louisiana, built by the Newport News Ship Building Co.

"Why, that is not strange at all," said Mr. Cramp when the dispatch was shown to him. "In fact, it is usually the case when figures are compared between vessels built by private concerns and those constructed by the government. That is the reason why municipal ownership has not proved a success. That is just why London is going bankrupt in the effort to carry out municipal ownership.

"A battleship is just as much a manufactured article as are shoes and hats. The same principle applies. Now, the government has no business to build ships any more than it has to manufacture rugs. Of course, there should be government stations. Of course, too, if there was a combination between the various ship builders—a trust, in other words—it would be an entirely different matter, and the government would be justified in taking some action to lessen the cost of her warships. But there is no combination. There is no agreement among the private ship builders as to how much they shall bid or how little they shall bid. There are not enough battleships given out to cause anything like that.

"If the pending bills are passed at Washington there will be two ships of the 20,000-ton class to be given out in the next two years. Four ship building concerns are hungry for them."

"Are the Cramps among the hungry ones?" was asked.

"Well that's what we are in business for," Mr. Cramp replied.

Mr. Cramp said that he was not sure whether several important items had been included in the compilation of the figures that showed that the government-built ship cost so much more than her sister vessel, the Louisiana. Two of these were insurance and interest on the money represented for the use of the yard. The insurance for the three years or more in which the Connecticut was being built would amount to \$30,000. The private builders are obliged by the navy department to insure every piece of metal as it is dumped into the yard.

Mr. Cramp said that the race between the builders of the Connecticut and Louisiana has been watched with interest by ship builders all over the country. That the private builder would win the race was expected, however, by those who were familiar with the methods of the Newport News Ship Building Co. and others of its kind.

A GIANT LINER.

Emil Boas, general manager of the Hamburg-American line, returned recently from a visit to Hamburg, where he inspected the plans of a new vessel to be built for the Hamburg-American Co., at the yards of Harland & Wolff, at Belfast. The new liner is to be a giant, built with the idea of furnishing the utmost accommodation for passengers rather than the attainment of remarkable speed. The name of the new vessel is to be Europa, and she is expected to be out some time in 1908.

The passenger capacity will be the largest yet planned by any of the trans-Atlantic lines. Besides the capacity for 4,200 passengers, there will be 500 men in the crew, and thus with the maximum list the vessel will carry 4,700 persons.

Some innovations are planned for the new boat, among them a tennis court and a swimming tank.

The Europa is to be of 42,000 tons displacement, 750 ft. long and 80 ft. beam. She will not be quite as long as the new Cunarders and not quite as fast, being built with an idea of stability and comfort rather than speed. The new vessel will make about 19 knots. She will embody all the accommodations that ocean-going travelers have become accustomed to—Turkish baths, elevators, telephones, electric heaters and coolers, and many more luxuries. Every safety device known to the marine scientists will be brought into play in order to guard against possible dangers, and the ves-

sel when it comes out will probably show several new appliances looking to the safety of trans-Atlantic tourists.

SECRETARY SHAW FOR A MERCHANT MARINE.

Secretary of the Treasury Shaw made a notable address recently before the New Hampshire board of trade. In addition to making a plea for a merchant marine, he advocated a plan whereby manufacturers might, under certain conditions, import raw material for their factories without the payment of duty. He suggested that it would be well to do away with the bonded factory and to substitute for it a bonded zone of large area, within which a large number of factories would be built. Into this zone in which articles for export only would be manufactured he would allow free coal and every other element of manufacture, except labor, to be entered free. Should, however, the product of these zone factories be removed for the purpose of domestic consumption, Secretary Shaw said that it should pay the same duty as if imported from abroad. He said that there should be such a zone on the North Atlantic coast, one at Norfolk, Va., and another at the Gulf.

"In addition to this," said the secretary, "we must have a merchant marine. The method by which this handmaid to the American exporter shall be secured, I do not care to discuss. The ultimate fact, however, is of prime importance. If we ever get our share of the import trade of South America, South Africa, and the adjacent islands, and our share of the import trade of the Orient, we must have ships making regular trips from our principal ports, flying our flag and begging our manufacturers to produce the articles desired by the countries to which they sail."

INCREASE IN BRITISH RATES.

Marine insurance underwriters of New York city, with the exception of the Atlantic Mutual Marine Insurance Co.—the only American corporation in New York which takes maritime risks—will shortly announce a radical increase in rates on oversea cargo between American ports and Europe.

Advices have been received from the home offices of the British companies that a new schedule is under consideration, and that conclusion is now only a matter of days. The reasons assigned for the coming increase are the extraordinary amount of losses incurred in the year 1906, and the rec-

ord of casualties for the past month of January, which argues ill if it be regarded as an omen of what ensuing months will bring forth.

From London sources it was learned that the advance in rates on cargoes of grain in first-class vessels will amount to fully 25 per cent, the rate of two-tenths of a cent a bushel on a full cargo of grain now being charged. Various rates obtain for various cargoes, but in each instance, it was said, a 25 per cent increase will be observed.

The increase will be welcomed by underwriters for the reason that their business of 1906 resulted in little profit. This was chiefly brought about by competition among the English companies, in which insurance was reduced to "perishing rates."

SHIP BUILDING IN GREAT BRITAIN.

The following statistics compiled by Lloyds show the status of ship building during the past year in Great Britain:

During 1906, exclusive of warships, 886 vessels of 1,828,343 tons gross (viz., 815 steamers of 1,809,433 tons and 71 sailing vessels of 18,910 tons) have been launched in the United Kingdom. The warships launched at both government and private yards amount to 29 of 108,450 tons displacement. The total output of the United Kingdom for the year has, therefore, been 915 vessels of 1,936,793 tons. In these notes, warships are excluded from consideration except where they are specially mentioned.

The output of mercantile tonnage in the United Kingdom during 1906 shows an increase of about 205,000 tons on that of last year, the previous highest on record. As regards war vessels, however, the total for 1906 is 21,351 tons less than in 1905.

It may be mentioned that over 99 per cent of the tonnage launched has been built of steel, and that 99 per cent is composed of steam tonnage.

Of the total output, 1,446,856 steam tons and 10,406 sailing tons, or 1,457,262 tons in all (over 79 2-3 per cent) have been built for registration in the United Kingdom. In this connection, it should be noted that the tonnage of United Kingdom vessels lost, broken up, etc., during twelve months is shown by Lloyds register wreck returns for recent years to average 251,000 tons (199,000 steam, 52,000 sail). Sales to foreign and colonial owners for the twelve months ended November, 1906, according to the registrar

general's returns, reached a total of 504,000 tons (421,000 steam, 83,000 sail). On the other hand 2,956 tons (steam) were built abroad for United Kingdom owners, and purchases from foreign and colonial owners during the same period amounted to 58,600 tons (55,500 steam, 3,100 sail). The sailing tonnage of the United Kingdom would thus appear to have decreased by about 121,000 tons, and the steam tonnage to have increased by 885,000 tons. The net increase of United Kingdom tonnage during 1906 is therefore the record figure of about 746,000 tons. For the previous five years the estimated net increases were as follows: 1901, 543,000 tons; 1902, 643,000 tons; 1903, 405,000 tons; 1904, 429,000 tons; 1905, 469,000 tons.

In 1906, 20 1-3 per cent of the total output has been built for foreign and colonial ship owners, as compared with 21 1/2 per cent in 1905, 18 2-3 per cent in 1904, 18 per cent in 1903 and 1902, 23 per cent in 1901 and 1900, 19 per cent in 1899, and 22 per cent in 1898. Germany has again provided the largest amount of work for the ship builders of the United Kingdom, viz.—26 vessels of 104,207 tons (nearly 5 3/4 per cent of the total output). Norway occupies the second position with 71,464 tons and South America comes third with 40,099 tons, being followed by the British Colonies (39,237 tons), France (19,674 tons), Denmark (14,988 tons), and Austria Hungary (13,239 tons).

Attention has been drawn in previous ship building summaries issued by Lloyds register to the increasing number of large steamers under construction. During the four years, 1892-5, on an average eight vessels of 6,000 tons and upwards were launched per annum in the United Kingdom; in the following four years, 1896-9, the average rose to 25, and to 39 for the four years, 1900-3, although it dropped to 26 for the three years 1904-6. Of vessels of 10,000 tons and upwards, only three were launched in the four years 1892-5; seventeen were launched during the four years, 1896-9; while 32 were launched during the four years, 1900-3, and 13 during the three years, 1904-6.

At the present time there are under construction 35 vessels of 6,000 tons and upwards, of which 12 are of over 10,000 tons each. The largest steamers which have been launched during 1906 are the following:

	Tons gross.
Lusitania	32,000
Mauretania	32,000
Rewa	7,267
St. George	2,436
St. David	2,387
St. Patrick	2,387
Immingham	2,009
Marylebone	1,940
Viper	1,713
Kingfisher	871
Duchess of Argyll	583
Atalanta	486

It may be noted that, excluding

steamers of less than 500 tons, the average tonnage of steamers launched in the United Kingdom during 1906 is 3,526 tons gross.

As was the case in 1905, the Newcastle district occupies the first place among the principal ship building centers of the country, showing an output of 385,987 tons. Then follow in order Glasgow (330,213 tons), Sunderland (326,701 tons), Greenock (238,457 tons), Middlesbrough (147,857 tons), Belfast (146,231 tons), and Hartlepool (144,603 tons). In warship tonnage the leading ports stand thus: Barrow (24,740 tons), Newcastle (17,120 tons), and Glasgow (16,750 tons).

The number of steamers in which the turbine method of propulsion has been adopted is steadily increasing. During 1906 twelve such vessels have been launched in the United Kingdom. Their names are as follows:

	Tons gross.
Lusitania	32,000
Mauretania	32,000
Rewa	7,267
St. George	2,436
St. David	2,387
St. Patrick	2,387
Immingham	2,009
Marylebone	1,940
Viper	1,713
Kingfisher	871
Duchess of Argyll	583
Atalanta	486

In addition to the two large express steamers for the Cunard company mentioned above, there are at present under construction in the United Kingdom seven merchant vessels of about 31,500 tons which are to be fitted with steam turbines.

The returns for the year under review include 35 vessels of the turreted-deck, trunk-deck and cantilever-framed types; 198 steam trawlers and other fishing vessels; 59 dredgers, barges, etc.; 29 tugs; 17 yachts; and other vessels designed for special service. Besides these, 35 vessels, principally intended for river and harbor purposes, have been built in the United Kingdom and taken to pieces for shipment abroad.

As regards the movement of the ship building industry during the course of 1906, Lloyds Register returns show that, at the opening of the year, irrespective of warships, 1,355,756 tons (1,350,839 steam, 4,917 sail), were being built in the United Kingdom. The returns for the March quarter indicated an increase of about 46,000 tons in the work in hand; and the June figures were slightly better still. The totals for September, however, showed a very large decrease (144,000 tons), and at the present time the work in progress (viz.—1,166,989 tons) is no less than 242,000 tons below the totals of six months ago, and only reached 82 1/2 per cent of the total for

September, 1901, when the highest amount of tonnage recorded in the society's returns as being under construction at any one time was attained. As regards the amount of warship

A COASTWISE SHIPPING QUIZ.

An investigation as rigid and complete as the recent railroad inquiry is to be made into the methods of the coastwise shipping interests by the de-

One thing is certain, according to shipping men, that if all of the questions are answered truthfully by the various companies not a few lines are going to find themselves in trouble, on grounds of restraint of commerce under the Sherman law, and upon other grounds as well.

One exceedingly leading question appears as No. 3 on the schedule as follows:

"If any of your vessels have operated on season contracts, give all such rates in force during 1906."

This means that the various companies must not only reveal certain methods that they would rather have hidden, but that their answers will give competitors a line on the inside nature of the company's contracts for last year. Question No. 7 is still more disturbing: "Do railroads pro-rate with your line?" This is regarded as a "stinger," to quote a steamship man's phrase.

It is well known that not a few of the large railroad companies, such, for instance as the Southern Pacific, with its Atlantic Coast Line Steamship Co., are interested in steamship lines, although of course this fact need not be accepted as a corollary of pro-rating. The Mallory, Clyde, Old Dominion and Savannah lines are also said to be interested more or less in railroads.

Another question is still more sweeping: "Is your line controlled by or affiliated with any other navigation line, or with any railroad, or with any dock, warehouse, or other terminal concern, whether by ownership, by lease, by mortgage, by ownership of stocks or bonds, or through traffic agreements, or is it in any other manner so controlled or affiliated? If so, specify in detail."

These questions are considered as more important than any of the others. Each question in all the eight pages of the schedule is so framed as to lead logically to the next; and a question unanswered would leave a serious break in the chain which the government, no doubt, would take steps to rectify.

Not a little speculation as to the effect of this investigation upon the C. W. Morse deal, whereby he secured control of the Eastern Steamship Co., the Metropolitan Steamship Co., the Mallory line, the Clyde line, the People's Hudson River line, and other smaller lines, was indulged in this morning.

"If Mr. Morse's lines are affiliated with railroads, then this investigation will not entirely redound to his advantage," was the common remark.

SUMMARY OF SHIP BUILDING RETURNS OF UNITED KINGDOM IN 1906, ARRANGED IN ORDER OF TONNAGE BUILT BY EACH FIRM.

NO. NAME OF FIRM.

NO.	NAME OF FIRM.	PLACE.	NO. OF SHIPS.	TOTAL TONS. [†]
1	Swan, Hunter, Wigham-Richardson, Ltd.	Tyne	25	126,921
2	Wm. Doxford & Sons, Ltd.	Wear	25	106,158
3	Harland & Wolff, Ltd.	Belfast	11	83,238
4	Workman, Clark & Co., Ltd.	Clyde	13	65,478
5	Russell & Co.	Clyde	14	63,338
6	Northumberland Shipbuilding Co., Ltd.	Tyne	11	51,400
7	Furness, Withy & Co., Ltd.	Hartlepool	11	46,443
8	John Brown & Co., Ltd.	Clyde	7	46,387
9	J. L. Thompson & Sons, Ltd.	Wear	12	44,544
10	Wm. Denny & Bros.	Clyde	12	40,632
11	R. Stephenson & Co., Ltd.	Tyne	12	39,131
12	Sir James Laing & Sons, Ltd.	Wear	9	38,055
13	Palmer's Shipbuilding & Iron Co.	Tyne	7	36,940
14	Sir W. G. Armstrong, Whitworth & Co., Ltd.	Tyne	15	36,814
15	Ropner & Son.	Tees	11	35,890
16	Wm. Hamilton & Co., Ltd.	Clyde	9	35,319
17	Barclay, Curle & Co., Ltd.	Clyde	6	33,618
18	D. & W. Henderson & Co., Ltd.	Clyde	6	33,187
19	Hawthorn, Leslie & Co., Ltd.	Tyne	8	32,650
20	Irvine's Shipbuilding & Dry Docks Co., Ltd.	Hartlepool	9	32,131
21	Charles Connell & Co., Ltd.	Clyde	7	31,105
22	J. Readhead & Sons.	Tyne	8	30,205
23	Craig, Taylor & Co., Ltd.	Tees	7	28,521
24	Grangemouth & Greenock Dockyard Co.	Clyde	10	28,460
25	R. Craggs & Sons.	Tees	8	28,314
26	Caird & Co., Ltd.	Clyde	4	26,778
27	Vickers, Sons & Maxim, Ltd.	Barrow	..	26,770
28	Sir Rayton Dixon & Co., Ltd.	Tees	8	26,610
29	Short Bros., Ltd.	Wear	6	25,393
30	Arcld. McMillan & Son, Ltd.	Clyde	8	23,276
31	Scott's Shipbuilding & Engineering Co., Ltd.	Clyde	11	23,179
32	A. Stephen & Sons, Ltd.	Clyde	6	22,981
33	William Beardmore & Co., Ltd.	Clyde	2	21,050
34	Fairfield Shipbuilding Co., Ltd.	Clyde	5	20,043
35	W. Pickersgill & Sons.	Wear	5	19,970
36	A. Rodger & Co.	Clyde	8	19,894
37	Sunderland Shipbuilding Co., Ltd.	Wear	8	19,241
38	Bartram & Sons.	Wear	5	18,465
39	J. Blumer & Co.	Wear	7	18,387
40	Tyne Iron Shipbuilding Co., Ltd.	Tyne	5	17,340
41	Earle's Shipbuilding & Engineering Co., Ltd.	Humber	15	14,228
42	London & Glasgow Shipbuilding Co.	Clyde	3	13,154
43	Robert Thompson & Sons.	Wear	4	13,079
44	Gourlay Bros. (Dundee), Ltd.	Tay	6	12,639
45	Caledon Ship & Engineering Co., Ltd.	Clyde	5	11,096
46	Clyde Shipbuilding & Engineering Co., Ltd.	Wear	6	10,806
47	Osbourne, Graham & Co.	Clyde	3	10,740
48	Napier & Miller, Ltd.	Clyde	3	10,710
49	R. Duncan & Co., Ltd.	Clyde	32	9,368
50	Ailsa Shipbuilding	Mersey	8	8,541
51	Cammell, Laird & Co., Ltd.	Blyth	8	8,496
52	Blyth Shipbuilding Co.	Wear	4	8,370
53	S. P. Austin & Son, Ltd.	Humber	33	7,940
54	Cochrane & Sons.	Clyde	19	7,920
55	Mackie & Thomson.	N. Shields	28	7,743
56	Smith's Dock Co., Ltd.	Clyde	10	7,664
57	John Reid & Co., Ltd.	Clyde	8	7,360
58	Fleming & Ferguson.	Humber	35	7,355
59	Cook, Welton & Gemmell, Ltd.	Clyde	5	6,884
60	David J. Dunlop & Co.	Clyde	11	6,350
61	Simons & Co., Ltd.	Clyde	19	5,659
62	Bow, McLachlan & Co., Ltd.	Wear	4	5,638
63	John Crown & Sons, Ltd.	Aberdeen	24	4,678
64	Hall, Russell & Co.	Clyde	11	4,539
65	Lobnitz & Co.	Thames	26	4,229
66	A. W. Robinson & Co.	Mersey	3	3,899
67	R. Williamson & Son.	Campbeltown	3	3,802
68	Campbeltown Shipbuilding Co.	Forth	5	3,788
69	Ramage & Ferguson, Ltd.	Hartlepool	24	85,111
70	Wm. Gray & Co., Ltd.	Tees	7	31,517
71	Richardson, Duck & Co.	Tyne	7	24,811
72	Wm. Dobson & Co.	Wear	5	15,403
73	John Priestman & Co.	Tyne	9	11,103

[†]Board of trade gross tons register.

*Board of Trade gross tons register including erections.

tonnage under construction in the country the highest total recorded by Lloyds Register was reached in March, 1900, when 454,000 tons displacement were in hand. The total is now 205,858 tons.

The Goldschmidt Thermit Co., 43 Exchange Place, New York, has just put out a tasty pamphlet on rail welding. The little catalog, which is beautifully printed, is descriptive of the operation of welding rails. It is well worth getting.

partment of commerce and labor. The opening move of the bureau of corporations of that department was made recently when every coast transportation company in New York received a document consisting of eight pages of questions with blank spaces for answers. These questions cover a wide range—not a point is left uncovered in fact—and suggest that they were based upon a minute study of the coastwise situation in all seaboard cities of this country.

RIVER AND HARBOR BILL.

Roughly speaking twenty-five per cent of the money carried by this session's river and harbor bill which passed the house of representatives last week is for the great lakes projects. The authorizations and cash appropriations for the great lakes amount to close to \$20,000,000 while the total for the bill is \$83,816,138.

Although the river and harbor appropriations did not reach a hundred millions which was the battle cry of river and harbor advocates, the amount reported by the house committee exceeds any that have been appropriated by any previous congress. It is altogether probable that the senate may add some to the bill but Chairman Burton, who is opposed to any amendments generally prevails in the conference committee between the two houses. There has been introduced in the senate, amendments which would double the amount appropriated by the house bill but it is not thought that the bill will be changed much from its present form when it is put upon its final passage.

As is shown in the subjoined table the only bill which approaches the size of this session's appropriation is the one that was passed in 1896.

Year.	Cash.	Authorized.	Total.
1896	\$12,659,550 00	\$59,616,404 91	\$72,275,954 91
1899	16,091,841 94	23,866,324 13	39,958,166 07
1902	26,771,442 00	38,336,160 00	65,107,602 00
1905	18,181,875 41	17,184,657 63	35,366,533 04
1907 (as reported by Committee on Rivers and Harbors)	35,181,612 00	48,634,526 00	83,816,138 00

This session's bill was formulated with a view of completing as many large projects as possible. In providing for this the committee adopted a new policy. On this subject, Chairman Burton in his report says:

"It has been thought best to undertake no new improvement unless the whole amount required for its completion, whether the project involves large or small expense, is appropriated or authorized. This policy has been followed with barely an exception. It is believed that the advantages of such a method are sufficiently obvious. Assured results will be obtained at an early date by the completion of the improvement. More substantial benefit will be conferred by selecting the most deserving projects and avoiding the scattering of appropriations. The expense for each improvement will be very much diminished, because work can be more advantageously and economically prosecuted if the whole amount necessary to complete is made available. It is also true as a practical fact that when the total expense is

to be provided at one time more careful consideration will be given to a proposed improvement and the question of its adoption more intelligently considered. The rule has been followed that between two projects equally deserving it is better to complete one than to make partial appropriations for both. Sixty-eight million seven hundred and seventeen thousand three hundred and ninety-eight dollars of the amounts included in the bill are for improvements of considerable magnitude already undertaken by the government or for further improvements in connection therewith, where increased traffic requires additional facilities."

There are nineteen items in the bill which exceed a million dollars. Of this class, three of them are on the great lakes. They are the Cleveland harbor, with a total appropriation of \$1,123,000, St. Mary's river at the falls, additional lock and duplicate canal (to complete) \$6,200,000; Detroit river, alternative channel (to complete) \$6,670,950.

The new lock at the Sault Ste Marie will be the largest in the world when it is completed. Its length between the gates will be 1,350 ft., giving the usable length of not less than 1,300

ft. shorter than the one that is authorized in this bill for the great lakes.

A complete list of the projects in the bill which exceed a million dollars is tabulated on this page.

Not the least important part of the bill to the great lakes are a number of surveys which are authorized. The survey authorized for the Duluth harbor provides for a report upon the feasibility of constructing another canal across the Minnesota point. The war department is given the widest range of authority in the bill with instructions to prepare some sort of plan for the improvement of Duluth harbor. There are several plans proposed and the secretary of war is instructed to investigate all of them.

Among the other surveys authorized for the great lakes are, Calumet river, with a view of obtaining a depth of 25 ft. from 122nd street to its forks. Channel between Russell island and Grand point in the St. Clair river. Ontonagon harbor with a view to determining if a change in the course of the Ontonagon river aid in maintaining the harbor; Menominee harbor to determine whether a breakwater is necessary; Keweenaw canal, to construct a harbor of refuge at its eastern entrance; Munising harbor on Sable river, to obtain a depth of 10 ft.; Grand Marais harbor to rebuild the westernly pier at the entrance and enlarging basin; Lake Superior, to locate a harbor or harbors on the north shore; Ogdensburg harbor, to obtain a depth of 19 ft. in the four existing channels and the excavation of the bar between the two entrance channels in the lower harbors. Niagara river from Tonawanda to Gill creek; harbor at Rocky river with a view to repair-

FIRST CLASS.—\$1,000,000 OR MORE.

	Cash.	Authorization continuing contract.
Harbor at Boston, 35-foot channel (to complete).....	\$ 500,000	\$ 3,894,000
Harbor of New York, Ambrose channel (to complete).....	1,000,000	1,148,510
Black Rock Harbor and channel.....	895,000	1,000,000
Delaware River, below Philadelphia (to complete).....	500,000	500,000
Patapsco River and channel to Baltimore (to complete).....	282,000	1,715,000
Channel from deep water in Hampton Roads to Norfolk.....	300,000	850,000
Savannah Harbor	350,000	700,000
Black Warrior, Warrior, and Tombigbee rivers.....	1,000,000	1,842,000
Southwest Pass, Mississippi River, below New Orleans (to complete).....	300,000	1,500,000
Galveston Harbor	223,000	700,000
Cleveland Harbor	265,000	900,000
Lock and Dam No. 26, Ohio River (to complete).....	1,458,966	800,000
Ohio River, general improvement and completing unfinished work on locks and dams.....	5,000,000	1,500,000
St. Marys River at the Falls, additional lock and duplicate canal (to complete)	1,200,000	5,000,000
Detroit River, alternative channel (to complete).....	2,000,000	4,670,950
Mississippi, from head of passes to mouth of Ohio River.....	3,000,000	6,000,000
Mississippi River, between Ohio and Missouri rivers.....	250,000	750,000
Mississippi River, between the Missouri River and Minneapolis.....	500,000	1,500,000
Mouth of Columbia River, Washington and Oregon (to complete).....	750,244	1,700,000
Total.....	\$14,774,210	\$36,670,460

Total of appropriations and authorizations \$51,444,670

total of appropriations and authorizations, improvements of the harbors will be in line with this depth of water. The only lock that will approach this new one at the Sault in size, will be the Panama canal lock. Even these locks will be only 600 ft in length or 500

ing existing structures and extension of the harbor, Lorain harbor; that portion of the Black river from the inner end of the government piers to East Erie avenue bridge; Maumee river from deep water in Lake Erie to

the Fassett street bridge with a view to obtaining greater depth and increased width of approximately 100 ft.; Erie harbor, with a view to obtaining a depth of 21 ft. and protecting Presque Isle peninsula; Algoma (Ahnapee),

ITEMS OF GENERAL INTEREST.

The Baptist Missionary Society has had built by Salters Bros., of Oxford, a stern-wheel steamer for use on the Congo. The vessel is 104 ft. 4 in. in length, 19 ft. beam and 5 ft. 6 in. depth.

The Moroccan gunboat Side el Turki which ran ashore in a recent storm, is probably a total loss. The crew was saved.

The Eastern Steamship Co. has awarded contract to the Bath Iron Works, Bath, Me., for a turbine steamer to be named City of Belfast. She will be 335 ft. long, 40 ft. beam and 17 ft. deep.

Arrangements have been completed for the inauguration of a steamship service between Mexican and Canadian Pacific coast ports and the first sailing will be made from Vancouver to Salina Cruz, in March.

The steamer Empress of China has broken the record for the trip from Yokohama to Victoria, B. C., having made it in 10 days, 3 hours, 30 minutes. The previous record was held by the Empress of Japan.

Two hundred men of Long Beach, Cal., are making great efforts to raise \$100,000 to induce the construction of a ship building plant by the Craig interests of Toledo, O., \$66,000 having already been subscribed, exclusive of mere guarantees.

The La Veloce Steamship Co.'s service from Naples to New York has been resumed, the new steamship Brazile having sailed for the latter port Feb. 7. The service has been discontinued for the past month or two owing to labor troubles at Naples.

The Hawaiian Immigration Society is reported to have chartered a steamer in London, purposing to take a thousand Spanish immigrants to Hawaii. Some time ago the steamship Suveric landed 1,200 Portuguese at Honolulu, the vessel having been chartered for that purpose.

Capt. Thomas Peabody, commander of the United States army transport Sheridan when it ran on a reef near Barber's Point, Island of Oahu, Aug. 31, 1906, has had his license as master and pilot of steamships revoked for six months and has been removed from his command by the war department.

Fifty-six members of the crew of the steamship Sonoma struck at Sydney, N. S. W., recently, delaying the mails to San Francisco. They were arrested and sentenced in police court to a month's imprisonment at hard labor for having disobeyed lawful commands.

The Cunard line turbine steamers now building are not 25-knot vessels, as has been commonly stated, but are required to make an average of 24½ knots on a round trip within one year after their completion. The British government is to pay £150,000 annually on condition that the speed is not below 23½ knots.

LIST OF APPROPRIATIONS FOR THE GREAT LAKES.		Expenditures authorized, continuing contracts
Project.	Appropriations, cash.	
New York:		
Buffalo Harbor	\$ 533,436	\$
Black Rock Harbor and Channel	1,000,000	1,000,000
Tonawanda Harbor and Niagara River	3,000	.....
Charlotte Harbor	88,500	.....
Great Sodus Bay Harbor	50,000	.....
Pultneyville Harbor	6,000	.....
Little Sodus Bay Harbor	75,000	.....
Oswego Harbor	100,000	100,000
Ogdensburg Harbor	75,000	.....
Ohio:		
Port Clinton	3,000	.....
Sandusky	125,000	.....
Huron	16,000	.....
Vermilion	15,000	.....
Black River (Lorain Harbor)	30,000	.....
Cleveland Harbor	223,000	900,000
Fairport Harbor	100,000	.....
Ashtabula Harbor	20,000	.....
Conneaut Harbor	20,000	.....
Muskingum River	48,000	.....
Michigan:		
Ontonagon	5,000	.....
Marquette	30,000	.....
Harbor of refuge at Grand Marais	30,000	.....
Manistique Harbor	25,000	.....
Menominee Harbor and River, Michigan and Wisconsin	5,000	.....
St. Joseph Harbor and River	16,000	.....
South Haven Harbor (conditional)	40,000	.....
Harbor at Saugatuck and Kalamazoo River	75,000	.....
Holland (Black Lake Harbor)	138,452	.....
Grand Haven Harbor	50,000	.....
Muskegon Harbor	75,000	.....
White Lake and Pentwater Harbor	20,000	.....
Ludington Harbor	100,000	739,087
Manistee	25,000	.....
Harbor of Refuge at Portage Lake, Manistee County	10,000	.....
Arcadia Harbor	6,000	.....
Frankfort Harbor	20,000	.....
Charlevoix Harbor and entrance to Pine Lake	20,000	.....
Petoskey Harbor	17,500	.....
Alpena Harbor, Thunder Bay River	4,000	.....
Cheboygan Harbor	15,000	.....
Harbor of Refuge at Harbor Beach	150,000	.....
Grand River	88,000	.....
Saginaw River	75,000	.....
Sebewaing River	2,000	.....
Mouth of Black River, Rouge River, and Monroe Harbor	12,000	.....
Black River at Port Huron	6,000	.....
Clinton River	2,500	.....
St. Marys River at the Falls	1,200,000	5,000,000
Detroit River, alternative channel	2,000,000	4,670,950
Detroit River, old project	150,000	150,000
Wisconsin:		
Kenosha Harbor	22,000	.....
Racine Harbor	50,000	.....
Milwaukee Harbor	200,000	392,000
Sheboygan Harbor	40,000	.....
Manitowoc Harbor	100,000	276,000
Two Rivers Harbor	90,000	.....
Kewaunee Harbor	5,000	.....
Algoma Harbor (Ahnapee)	3,000	.....
Green Bay Harbor	5,000	.....
Ashland Harbor	90,000	.....
Port Wing Harbor	2,000	.....
Fox River	35,000	.....
St. Croix River, Minnesota and Wisconsin	4,000	.....
Minnesota:		
Grand Marais Harbor	5,000	.....
Agate Bay	4,000	.....
Duluth, Minn., and Superior, Wis.	525,000	.....
Minnesota River	2,000	.....
Michigan City Harbor	60,000	.....
Illinois:		
Waukegan Harbor	50,000	.....
Chicago Harbor	250,000	.....
Calumet Harbor	20,000	.....
Chicago River	20,000	.....
Calumet River, Illinois and Indiana	191,500	.....

with a view to constructing an outer harbor and obtaining a channel 16 ft. in depth; Kewaunee, with a view to obtaining depth of 18 and 20 ft., respectively.

The Maryland Steel Co., Sparrow's Point, Md., has just received contract from the Isthmian canal commission for the construction of two suction dredges.

A new 14,000 ton twin-screw steamship for the Dominion line's Canadian service will be built by Harland & Wolff, Belfast.

The anchor and chain of the confederate armor clad Merrimac, which fought the famous battle with the Monitor, was recovered from the bottom of Hampton Roads recently, a fishing schooner's mud hook having got afoul of it.



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ANTHRACITE FOR THE NAVY.

Rear Admiral Robley D. Evans, U. S. N., in the current issue of the *North American Review* has propounded a rather startling scheme. In stating his contention, he says:

I believe that the government of the United States should at once possess itself of the entire anthracite field of Pennsylvania and retain it for purposes of national defense. And if, through accidental discovery, other deposits of this precious mineral are developed, they should be instantly appropriated by the national government and reserved for its own uses. Being a sailor, of course I mean naval uses, first of all.

The proposition is, I know, startling, but I believe its soundness can be demonstrated.

The desirability of anthracite as a fuel for the navy is clearly demonstrated by Admiral Evans, for aside from the fact that it is smokeless, the strategic value of which is at once apparent, it is also true that America is alone among the nations possessing anthracite in workable quantities. Other lands have bituminous coals in

abundance even as we have, but if our war vessels used only anthracite, such alone would be stored at our various coaling stations which the naval forces of hostile nations would not be able to use in their bituminous furnaces, whereas the change from anthracite to bituminous for our vessels would be but a simple matter should it become necessary.

The ability to maneuver without the dense smoke in view is equaled also by the fact that anthracite produces no tell-tale torch of flame from the funnels as was the case when the cutter McCullough brought fire from the guns at Corregidor island on the occasion of Admiral Dewey's night entrance into Manila bay, thereby nearly precipitating disaster upon the enterprise.

Admiral Evans lays considerable stress upon the inability of the signal men on the various vessels of a fleet to see the signals from the flagship, owing to the dense black smoke surrounding them. Of course this might lead to serious complications in event of war. Admiral Evans also says:

It is a fact not generally known at present that anthracite was the naval fuel of the civil war, on the northern side at least, and every American should be proud of that page of history. Only by the use of that fuel was the federal fleet enabled to maintain the greatest blockade the world has ever known, on thousands of miles of coast-line, from the Virginia capes to the Mexican boundary on the Gulf of Mexico. * * * The question naturally arises, Why was the use of anthracite abandoned by the American navy? The answer is to be found in two words, "economy" and "speed." For many years after the civil war, American naval vessels continued to use hard coal. Those were the days of combined sailing and steaming ships, and coal was used sparingly and only in cases where great haste was required.

With the advent of the new naval policy in the early eighties, British models were followed. Like all foreign designed ships they were planned for the use of soft coal. Engineers contend that for a given grate surface more power and speed may be obtained from soft coal than from hard, therefore we followed this policy.

The use of oil fuel for the navy is not favored by Admiral Evans for several reasons. First, it does not admit of forcing—the dashes of speed so necessary in naval practice; second, it would be dangerous to store oil alongside of tons of explosives, "the ship's company would be living over a volcano, so to speak. And in battle a single shell might fire the

whole ship." Lastly, Admiral Evans asks the pertinent question as to where it would be possible to obtain oil in foreign ports. At only a very few he declares it could be obtained at reasonable rates.

Admiral Evans concludes by saying:

About eighteen billion dollars would represent, at present values, the available anthracite deposits which the United States government should acquire to possess the entire store of this fuel. The figures are startling; but remember that this vast sum is not necessarily to be disbursed at once. In fact, it may be spent in the course of centuries—only, indeed, as the fuel is mined and consumed. It will be for the actuary to calculate the compensation which the government shall make to the individual owners of the coal fields; to capitalize their holdings, and provide for a systematic reimbursement.

Against our will; by the practice of the arts of peace; indeed, through our industrial competition with foreign nations and our insistence upon our rights to equal privileges and fair treatment; we may at any moment be plunged into hostilities. That is where that celebrated utterance of Pinckney's would find its bearing—"Millions for defence, but not one cent for tribute." The millions would lie in our anthracite beds, and our navy would do the rest. Picture the fate of a vast hostile fleet assembled off our Atlantic seaboard, with its colliers and tenders laden with soft coal, belching great clouds of smoke of inky blackness by day and columns of fire by night, while around them circled our swift scouts and cruisers and torpedo-boats and, within convenient signal range, our great battleships, each representative of a sovereign state—all well-nigh invisible, but ready to dash in at an opportune moment and deal a vital stroke. And all because of anthracite. Would it not pay?

ADMIRALTY TRIALS OF SUBMARINE SIGNALS.

In October last an extensive series of experiments was carried out at Portsmouth by order of the admiralty to test the suitability of submarine bells for use in the fleet and as a means of locating light-vessels and other craft in time of fog. H. M. S. Antrim and Spanker were detailed for this special service, and the trials were made under the direction of Capt. H. F. Oliver, M. V. O., of H. M. S. Dryad; Capt. A. F. Everett, of the Portsmouth Signal School; and Capt. W. C. Pakenham, C. B., of H. M. S. Antrim. Certain extracts from the official report of the trials have been made public by the admiralty. We understand that the report contains a good deal of information of a confidential nature as to the suitability of the system for fleet signaling, and there is every prospect of subaqueous sound signaling forming an important factor in future fleet maneuvers.

After detailing certain experiments, the report says: "This shows that at a distance of five miles the submarine bell could be heard and its distance determined with certainty, and this is a distance beyond the certain range of any of the aerial sound signals in use by light-vessels in fog. When at five miles

distance an officer stationed below was able to hear the bell by placing his ear against the ship's side below the water-line.

Experiments were then made to test the possibility of correctly locating a vessel, and it was further found that at 16 miles the signals were audible when the engines of the Antrim were stopped.

The report concludes with the following remarks:

The results obtained in these tests demonstrate the extreme utility of the submarine bell as an adjunct to coastal navigation in thick weather. The fog signals at present in use in light-ships in Great Britain cannot be depended on to be heard in all conditions, even at one or two miles' distance; and a vessel, failing to make the fog signal out, may be on a safe course and in her estimated position, yet she must stop or anchor or alter course out, because she is uncertain. The submarine bell increased the range at which the fog signal can be heard by a vessel until it approximates to the range of a light-vessel's light in clear weather, and, moreover, its bearing can be determined with quite sufficient accuracy for safe navigation in fog from distances far beyond the range of aerial fog signals, if the vessel is equipped with receivers.

Even should a vessel not be so equipped, the submarine bell can be heard from below the water-line for distances which are well outside the range of aerial fog signals, although its direction cannot then be so well determined.

To double or treble the distance at which fog signals can be heard is a great advantage to shipping, and the facility of determining the direction of a sound signal is in itself a very valuable discovery. The installation of submarine bells in light-vessels must come sooner or later, as is proved to a great extent by its adoption by other nations; those who wait longest will incur the greatest loss in the meantime, both in ships and lives, and through delays to shipping which would otherwise be avoided.

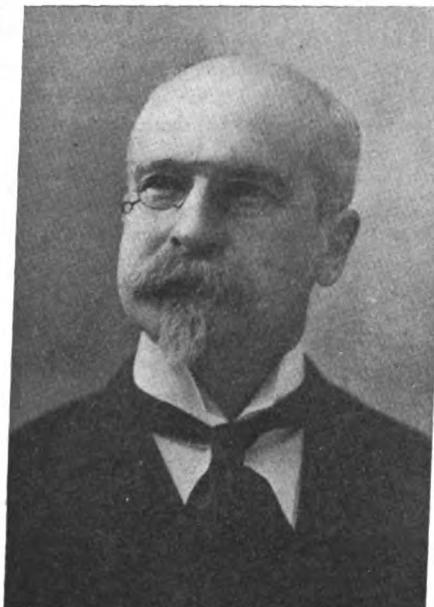
OBITUARY.

The death of Rear-Admiral Kautz occurred recently at Florence, Italy, at the age of 68. The deceased had an interesting career. He took part in the capture of New Orleans under Farragut and hauled down the Lone Star flag in person.

Capt. G. J. Grammer, vice president in charge of all the railroads of the New York Central system, died at Chicago last week, at the age of sixty-three years. He was born in Zanesville, O., and in his early life was in command of several boats running on the Ohio and Mississippi rivers. He

took up railroading in the 80's and in 1894 joined the Vanderbilt system. He was a man whose personality was greatly admired by all who knew him.

Hugh McMillan, brother of the late senator McMillan, died at the family residence at Detroit on Monday last. He was born at Hamilton, Ont., in 1854, and went to Detroit in 1861, becoming a clerk in the office of the De-



HUGH McMILLAN.

troit & Milwaukee railway. Later he became associated with his brother in the Michigan Car Co. and the Detroit Car Wheel Co. Later he became interested in a variety of enterprises, including the Michigan Wheel Co., of which he was vice president and general manager; the Baugh Steel Forge Co., the Commercial National Bank, the Detroit Pipe & Foundry Co., the Michigan Telephone Co. and a number of enterprises. He was interested in a number of steamboat companies, but his activity in this direction was mainly confined to the Detroit & Cleveland Steam Navigation Co., of which he was vice president and treasurer at the time of his death. He devoted much attention to the affairs of this company and was in a great measure responsible for its success. Mr. McMillan was fond of books and works of art and had many social gifts. He was for three years the president of the Detroit club.

AROUND THE GREAT LAKES.

Capt. U. S. Cody will sail the steamer J. T. Hutchinson this year.

The old steamer George T. Hope has been reconstructed at Algonac and renamed Patrick Culligan.

Capt. Alfred Mitchell is in Florida.

The little steamer Thomas R. Scott has been sold by W. M. Mills, of Marysville, Mich., to Canadian parties.

Capt. Joseph Murphy, who sailed the steamer Martin Mullin last season, will take out the Joseph G. Butler this year.

The steamer Carry Ryerson was sold at a libel sale at Muskegon last week and was bought by Wm. Brinen, of Muskegon, for \$1,600.

Three government scows sold at auction at Toledo, were purchased by the Windsor Towing & Dredge Co., Windsor, Ont., for \$425 each.

The steamer Curry, of the Hawgood fleet, was successfully released from the beach at Buffalo after part of her grain cargo had been lightered.

Mr. Joseph Ripley, formerly superintendent of the Sault Ste. Marie canal, has been promoted to assistant engineer of the Panama canal.

The new sailing directions, No. 108 A, for Lake Superior has just been published by the hydrographic office and is for sale by the MARINE REVIEW.

E. E. Hull, chief engineer of the steamer Harry Coulby, last season, has been appointed fleet engineer of the United States Transportation Co.'s fleet.

The Wayne Iron Ore Co. has filed its certificate of incorporation in the office of the county clerk at Buffalo. The officers are: Markus M. Drake, Henry L. Chamberlain, Frank A. Abbott, Frederick W. H. Jones, all of Buffalo, and Freeman Pintler, of Ontario.

The International Association of Passenger Steamer Stewards in annual meeting at Buffalo last week, elected the following officers: Charles A. Schantz, Buffalo, president; Garvan Watson, Chicago, vice president; Julius Hering, Detroit, secretary; Alfred Welfare, Detroit, treasurer.

The Barnett & Record Co., of Duluth, has taken contract for the construction of a coal dock in Superior for the Berwind-White Coal Co. The dock will be 450 ft. wide and 1,200 ft. long, and will be located between the Pittsburg and Standard Oil docks in the upper harbor.

R. Parry Jones, representative of the underwriters of Cleveland, has closed contract with the Donnelly Salvage & Wrecking Co., of Kingston, for releasing the steamers Hurlburt W. Smith and Wm. Nottingham which are ashore at Buffalo. Capt. Thomas Donnelly, manager of the wrecking company, has offered to float both of these steamers for \$39,500.

AIDS TO NAVIGATION RECOMMENDED.

The Lake Carriers' Auxiliary Committee on Aids to Navigation has now been made permanent with Capt. John Lowe, of the Pittsburgh Steamship Co.'s fleet, as chairman, and George A. Marr, secretary of the Lake Carriers' Association, as secretary. The members of the committee are: Capt. Robert Murray, of the Western Transit Co.; Capt. Edward Martin, of the Anchor line; Capt. S. C. Allen, of the Pittsburgh Steamship Co.; Capt. H. H. Parsons, of the Cleveland-Cliffs Iron Co.; Capt. C. B. Galton, of Mitchell & Co.; Capt. J. L. Weeks, of the Gilchrist Transportation Co.; Capt. C. H. Woodford, of the Sherwin-Williams Co.; Capt. C. A. Benham, of Hutchinson & Co.; Capt. J. H. Ivers, of M. B. McMillan's fleet; Capt. M. A. Budd, of W. A. Hawgood & Co., and Capt. Thomas Hough, of the Rutland line.

Following are the full recommendations of the committee:

RULES FOR LEAVING THE SOO PIERS AND OTHER PLACES AFTER A CONGESTION OF BOATS: We recommend the following: That a government official of the revenue cutter service be empowered to take charge of the departure of all boats after leaving the lock and tying up below the canal, and that they will be under his jurisdiction until they have gotten under way according to his directions.

We recommend that if several boats are tied up alongside of one another at the south pier, that the lower outside boat in the fleet should be the first to start, and in rotation, tier by tier, according to his judgment.

We also recommend that when boats are placed at the piers and when starting in the morning, that all tows should be started away from the piers with short tow lines and instructions to lengthen them out according to their own judgment when in Hay Lake, as they usually cause considerable detention to other steamers when getting under way. When tying up at the dock, steamers and their consorts shall be in the same tier when practicable. Due consideration shall be given boats leaving the Canadian or American lock.

We recommend that the Lake Carriers' Association suggest to the superintendent of the canal that he do not allow the upper south pier to be congested with numerous craft lying there.

We recommend that boats bound down check to a speed of six miles an hour going through the water from Fort Gratiot Light to a point abreast the elevator at Sarnia. And furthermore, that no boat shall be allowed to pass another bound down from abreast the Lake Huron lightship to a point abreast of the elevator at Sarnia.

We recommend that no boat shall pass

another going the same way from Windmill Point light to Belle Isle light.

We also recommend that some provision be made for the departure of all downbound vessels that accumulate and come to anchor in the vicinity of Smith's coal dock, Detroit river, and the lime kilns, on account of fog or low water; and that no loaded boats be allowed to pass one another between Mamajuda and Bar Point bound down, passenger boats expected; provided, however, that no downbound passenger steamer shall pass another boat going in the same direction inside the stakes between the upper can buoy abreast of Ballard's Reef and the lower end of Bois Blanc island. This rule does not apply to steamers of 500 gross tons or less.

We would recommend that a patrol boat be stationed in lower Detroit river with a government official in charge to control the movement of all boats; that all vessels that come to anchor be controlled by the official and that they all leave in their turn of arrival, or as their draft of water will permit.

AIDS TO NAVIGATION.

NORTH PIER, DULUTH: Green light same height as lighthouse on south pier.

NORTH PIER, SUPERIOR: Same character of light as above on outer end of north pier.

TWO HARBOURS: Red light over white light on north end of south breakwater.

YORK ISLAND SHOAL: Gas buoy on York Island Shoal, in the Apostle Group, Lake Superior.

PORTAGE SHIP CANAL: Change the present main light to a second order red flash light.

PORTAGE ENTRY: Fog whistle on lower end of Portage Entry pier.

MARQUETTE: That the breakwater be extended at least 1,000 feet south, and that a light and fog bell be placed on end of breakwater.

GRAND ISLAND: That a gas buoy be placed on the southwest point of Grand Island in place of the spar buoy which is now on Williams' Landing Shoal.

PANCAKE SHOAL: Gas buoy on Pancake Shoal (Canada) about 10½ miles northwest of Whitefish Point, Lake Superior.

HEAD OF ST. MARY'S RIVER: Better day marks and better lights at head of St. Mary's River range.

MICHIPICOTEN ISLAND: Lighthouses and fog signals at east and west ends of Michipicoten Island (Canada).

BLAKE'S POINT, ISLE ROYALE: Gas buoy on 18-ft. shoal east of Blake's Point, Isle Royale, 2¾ miles SW by S from the lighthouse on Passage Island.

JACKFISH BAY: Lighthouse and fog signal at entrance to Jackfish Bay (Canada).

ST. MARY'S CANAL: Change character of the light from a red to a green light on the west end of the south pier, upper

entrance to St. Mary's canal; also a fog bell to be struck by machinery to be established at same place.

STIRBLING POINT AND DARK HOLE: Trees to be cut away so as to expose ranges.

STRIPLING POINT: Gas buoy with red light to be placed opposite the lower black gas buoy at Stribling Point.

COYLE POINT: Black gas buoy abreast of the upper red gas buoy.

PIPE ISLAND PASSAGE: Black gas buoy to replace black stake on east side of middle ground off Watson's Coal Dock in Pipe Island Passage.

PIPE ISLAND: Red stake on northwest corner of Pipe Island to show the limits of navigation.

DETOUR: Change character of light from a fixed white light to a second order flashing white light, 10 seconds interval, in movement similar to Whitefish Point light.

HOLDRIDGE SHOAL: Red gas buoy, E by S½S nine miles from Detour lighthouse.

FALSE PRESQUE ISLE HARBOR: Range lights in False Presque Isle harbor, Lake Huron.

NINE MILE POINT: 10½ miles east of Cheboygan lighthouse, Lake Huron entrance to Straits of Mackinac; lighthouse of the second order with, fixed red light and fog signal attachment.

CHEBOYGAN REEF: Black gas buoy with white light on Cheboygan Reef about a mile and a half from the lighthouse on Cheboygan Point to replace nun buoy now there.

BIG POINT SABLE: Fog whistle on Big Point Sable, east shore of Lake Michigan.

FOX POINT, WISCONSIN: West shore shore of Lake Michigan about seven miles north of North Point, Milwaukee; lighthouse of the second order with red and white flash light and fog signal.

GARDEN ISLAND SHOAL, BEAVER GROUP: Gas buoy on north side.

STAG ISLAND CHANNEL: Two sets of ranges on American shore west side of Stag Island channel; one to enter channel from lower end, and the other for entering the upper end.

INDIAN POINT: Range lights on Indian Point for passing head of Russell's Island, one-half mile below Chenal Ecarte or Bear Creek.

ST. CLAIR FLATS CANAL: Three gas buoys on west side of new channel.

ST. CLAIR FLATS CANAL: Green light on lower end of east pier at a height of not less than 20 feet above the pier.

LAKE ST. CLAIR SHOAL: About half to three-quarters of a mile below the red can, almost in line with east pier we recommend that this be dredged off.

BELLE ISLE: Red range lights on the upper end of Belle Isle leading from the Grosse Point channel to the intersection of Windmill Point ranges.

WINDMILL POINTS Trees to be removed to expose ranges at Windmill Point.

BALLARD'S REEF: Three gas buoys on west side of Ballard's Reef channel.

FIGHTING ISLAND: Red gas buoy to replace Fighting Island lower buoy No. 8.

BAR POINT: Red gas buoy on east bank of channel at Bar Point to replace red stake about 1½ miles north of lightship.

GRECIAN SHOAL: Gas buoy on Grecian Shoal about three miles NW of Colchester lighthouse.

HURON, Ohio: Red rear and white front range lights on the west pier and a light of suitable character on the end of east pier.

KELLY'S ISLAND SHOAL: Gas buoy on Kelly's Island shoal, west end, to replace nun buoy No. 2.

LORAIN, Ohio: West end of the east breakwater and east end of the west breakwater to be suitably lighted; and a suitable light to be placed on the outer end of the east pier.

FAIRPORT, Ohio: Suitable light on the outer end of the west pier and suitable lights on the end east of the west breakwater and the west end of the east breakwater.

ASHTABULA, Ohio: Suitable light on the west end of the east breakwater and suitable light on the outer end of the east pier.

CONNEAUT, Ohio: Suitable light on the west end of the east breakwater and suitable light on the outer end of the east pier.

ERIE: We recommend that the gas buoys, both inside and outside, be left out until navigation closes; and that the north pier be extended 1,000 feet and that suitable ranges be placed on same.

POINT ABINO (Canada): Light of the second order and fog signal.

BALLAST ISLAND: Light of the fourth order with fixed white light on north end of Ballast Island.

ST. CLAIR RIVER: We recommend that the shoal spots between St. Clair middle ground and Courtright be removed.

DEPUTY COLLECTORS OF CUSTOMS. We recommend that deputy collectors of customs be stationed all night at the following places to enable vessels to report and clear: West Superior, Escanaba, lower dock, Ashland, Two Harbors, Erie, Fairport, Lorain Steel Plant, Buffalo.

SUBMARINE SIGNALS. We recommend that submarine signals be located at the following places: Southeast Shoal, Lake Erie; Detour, Lake Huron; Thunder Bay Island, Lake Huron; off Crisp Point, Lake Superior; Devil Island, Lake Superior; Point Betsy, Lake Michigan; South Chicago, Lake Michigan; Russ Shoal, North Manitou, Lake Michigan; Poe's Reef, Straits of Mackinac, Lake Huron.

WHISTLES ON BRIDGES. We recommend that all bridges over navigable waters be

equipped with good and efficient whistles and that they sound the same signal that a steamboat does, and then if there is any danger, give the alarm signal the same as is required of steamboats.

LIFE SAVING STATION, GRAND ISLAND. We request the Lake Carriers' Association to recommend, on account of the number of wrecks in this vicinity, a life saving station at some place on the southerly end of Grand Island or vicinity, Lake Superior.

LIFE SAVING STATIONS, ISLE ROYALE AND NORTH SHORE OF LAKE SUPERIOR. We request the Lake Carriers' Association to recommend, on account of the number of accidents that have happened in this vicinity, that life saving stations be established at Blake's Point, east end of Isle Royale, and on Washington Island, west end of Isle Royale.

And also of life saving stations in the vicinity of Two Islands and at Beaver Bay, north shore of Lake Superior.

WATER GAGES, LIME KILN CROSSING. We recommend that the Lake Carriers' Association establish a water gage at Detroit River lighthouse to notify up-bound loaded steamers the stage of water on Lime Kiln crossing; and also that they place back a gage on the Pittsburgh Coal Co.'s dock at Sandwich.

WATER TORCHES. We recommend that a supply of water torches be carried on all vessels navigating the great lakes.

BLOWING CHECK WHISTLES. We recommend that the Lake Carriers' Association instruct all owners to caution masters to be careful and blow check whistles to steamers following when they themselves check down.

LAUNCHING OF THE STEAMER J. H. BARTOW.

The steamer J. H. Bartow, building for E. D. Carter, of Erie, was launched at the Wyandotte yard of the American Ship Building Co. on Saturday last and was named by Miss Kitty Allen. The Bartow is a duplicate of the E. D. Carter which came out last year and is therefore 524 ft. over all, 504 ft. keel, 54 ft. beam and 30 ft. deep. She has thirty hatches spaced 12 ft. centers. Her engines are triple-expansion with cylinders 22½, 36 and 60 in. diameters by 42 in. stroke, supplied with steam from two Scotch boilers, 13 ft. 9 in. diameter by 11 ft. 6 in. long, equipped with Ellis & Eaves draft and allowed 180 lbs. pressure. She will carry 9,000 tons of ore.

Guests were in attendance from Cleveland, Erie, Pittsburgh and Chicago. The list included Miss Allen, Mrs. Albert McDonald, Mrs. W. L. Scott, Miss Clara Thompson, Mr. E. D. Carter, B. J. Walker, Addison Walker, L. A. McElroy, Frank Gal-

lagher, Capt. Morrel, of the Wolverine; R. J. Moorehead, Clarence W. Thompson, Julius Seigel, George Bliss, J. S. Curtis, Wm. Shenk, Albert McDonald, Frank Connell, Charles Messenkopf and Capt. C. H. Wilson, all of Erie; J. H. Bartow, J. A. Donaldson, George Randerson, P. H. Longan, L. J. Cameron, Fred Saal, W. P. Bowman, Capt. Ed. Thorp, S. H. Holding, Harvey D. Goulder and N. P. McKean, all of Cleveland; Harry Irwin, Mrs. Williams and Miss Richardson, of Pittsburgh; W. H. Traver and W. D. Preston, of Chicago. Mr. James Dickie, of San Francisco, formerly of the Union Iron Works, was also present, and the ship building company was represented by M. E. Farr, Frank Jeffrey and E. Ketcham. The ship building company entertained the launching party at luncheon at the Detroit club.

THIRD LOCK AT SAULT.

Washington, D. C., Feb. 13.—It is possible that an amendment may be attached to the river and harbor bill in the senate for the purpose of preventing any delay in the construction of the third lock at Sault Ste Marie on account of the litigation between the rival power companies. Chairman Burton, of the house committee, has such an amendment under consideration and if one can be framed that is satisfactory to him and the members of the senate committee it will be incorporated in the bill before it is returned to the house.

Besides this it is stated that the circuit court of appeals, at Cincinnati, will shortly hand down the decision which will determine the status of the Chandler-Dunbar water rights. This decision is expected to clear up the situation and place the war department in a position to take some action by which the work on the new lock can be started as soon as the appropriation is available.

Chairman Burton is very anxious that either the war department shall take some action or the court shall render a decision which will determine exactly what rights the Chandler-Dunbar Co. possess at the Sault.

While Mr. Burton was not inclined to discuss what policy he intended to pursue, he said. "The situation is a very vexing one, but I believe that if can be straightened out in such a manner as not to delay the work on the new lock. Just at present I do not see my way out, still I think that the matter will be adjusted satisfactorily to all concerned."

MARINE ENGINEERS' WAGE SCHEDULE.

At the annual meeting of the National Marine Engineers' Beneficial Association at Washington a wage schedule was submitted for the lakes. The schedule differs in some particulars from that under which vessels were operated on the lakes last year. When the lake delegation presented it to the vessel owners it was referred to the new Association of Fleet Engineers, of which Mr. F. B. Smith of the Pittsburg Steamship Co. is chairman, and George A. Marr, secretary of the Lake Carriers' Association, is secretary. This new organization includes the chief engineers of all lines in the Lake Carriers' Association and will hereafter handle all labor matters affecting the machinery end of the ship. Two conferences were held with the marine engineers by the Association of Fleet Engineers, there being present F. B. Smith of the Pittsburg Steamship Co., Wm. Fettig of Mitchell & Co., James Mitchell of the Gilchrist Transportation Co., Thomas Durkin of the Cleveland-Cliffs Iron Co., Gilbert Patterson of the Tomlinson fleet, E. Hull of the United States Transportation Co., H. C. Jordan of the Union Steamboat Co., and Joseph F. Hayes of the Wolvin fleet.

The essential difference between last year's schedule and this lay in the creation of a new class of steamers. This class embraces all steamers of 4,000 tons and less than 5,500 tons. They have the same wages as steamers of 5,500 tons and over, with the exception that steamers of 5,500 tons and over carry a second assistant engineer at \$80 a month, whereas the new class will not carry a third engineer unless equipped with water-tube boilers and mechanical stokers.

There were also some minor differences concerning board and transportation during the laying-up and fitting out-season, but these were satisfactorily adjusted. In fact, after the fleet engineers had made their recommendations it did not take the executive committee of the Lake Carriers very long to enter into a working agreement for the coming year. This agreement is as follows:

The following is in part a copy of the agreement as signed by the Lake Carriers and Engineers:

PASSENGER STEAMERS.

Steel, Iron or Wooden.

Class A—All steamers of 1,200 tons or over.

Class B—All steamers of 300 tons and less than 1,200 tons.

Class C—All steamers not included in classes A and B.

All passenger steamers shall carry the same engineers' crew as during the past two years.

WAGES.

Class A—Chief engineer, \$150 per month; first assistant engineer, \$100 per month; second engineer, \$75 per month.

Class B—Chief engineer, \$125 per month; assistant engineer, \$90 per month.

Class C—Chief engineer, \$105 per month; assistant engineer, \$75.

STEEL FREIGHT STEAMERS.

Class A—All steamers over 5,500 tons.

Class B—1. All bulk freight steamers of 4,000 tons and less than 5,500.

Class B—2. All bulk freight steamers of 2,100 tons and less than 4,000 tons.

Class C—All steamers of 500 tons and not included in classes A and B.

Class D—All steamers under 500 tons.

CREW LIST AND WAGES.

All A class steamers to carry three engineers. Wages, chief engineer, \$175 per month; first assistant engineer, \$115 per month; second assistant engineer, \$80 per month.

Wages B—1 class, chief engineer, \$175 per month; first assistant engineer, \$115 per month. When equipped with water tube boilers and mechanical stokers, third engineer to be carried at \$80 per month.

Wages B—2 class, chief engineer, \$150 per month; first assistant, \$100 per month. When equipped with water tube boilers and mechanical stokers a third engineer is to be carried at \$75 per month.

All C class steamers to carry two engineers. Wages, chief engineer, \$125 per month; assistant engineers, \$90 per month.

All D class steamers to carry two engineers. Chief engineer, \$105 per month; assistant engineer, \$75 per month.

Steel package freight steamers of 3,000 to 5,500 gross tons to carry three engineers whose wages shall be as follows: Chief engineer, \$150 per month; first assistant, \$100 per month; second assistant, \$75 per month.

Steel package freight steamers of 1,800 to 3,000 gross tons to carry two engineers, whose wages shall be as follows: Chief engineer, \$150 per month; first assistant engineer, \$100 per month.

OILERS, ETC., REQUIRED.

Steel, Freight and Passenger Steamers.

All A and B class steamers to carry two oilers and water tenders where required.

All B class steamers having water tube boilers or more than three boilers of any kind are to carry two (2) oilers and water tenders where required. All other B class steamers not included in above are to carry two (2) oilers.

Handy men are also to be carried where required.

All B class passenger steamers to carry not less than one (1) oiler.

All C class steamers over 1,000 tons, having water bottoms and auxiliary machinery, to include electric light engines, steam steering engines, capstan engines, steam windlasses, blowing engines, hoisting engines, running shaft line—two oilers. All other C class steamers of 1,000 tons or over, having water bottoms, steering engine and windlass engine only—one oiler.

WOODEN FREIGHT STEAMERS.

Class A—All bulk freight steamers of 1,200 tons or over, and all package freight steamers of 750 tons or over.

Class B—All bulk freight steamers of 600 tons and less than 1,200 tons, and all package freight steamers of 600 tons and less than 750 tons.

Class C—All steamers of 200 tons and less than 600 tons.

Class D—All steamers not included in classes A, B and C.

CREW LIST.

All steamers to carry two engineers. All A class package freight steamers over 1,500 tons to carry two oilers. All under 1,500 tons, one oiler. All A class bulk freight steamers over 1,500 tons to carry not less than one oiler.

WAGES.

Class A—Chief engineer, \$125 per month; assistant engineer, \$90 per month.

Class B—Chief engineer, \$114 per month; assistant engineer, \$84 per month.

Class C—Chief engineer, \$103 per month; assistant engineer, \$75 per month.

Class D—Chief engineer, \$95 per month; assistant engineer, \$65.

WORK ON STEAMERS WHEN NOT IN COMMISSION.

If it is the desire of employers to engage members of the M. E. B. A. for such work as boiler room work after the boilers have been properly laid up, boring cylinders or putting in crank pins after the engine has been laid up, piping after decks have been raised or repairs have been made thereto, or during and after the resetting of boilers, and such members are either the regular engineer or others, it shall be considered proper for members of the M. E. B. A. to engage themselves, if they so wish, at a compensation mutually agreed on between themselves and their employers. Under no circumstances shall there be any discrimination against an engineer should he refuse such employment. It is understood that all other work in the engineer's department shall be considered either fitting out or laying up and the full complement of engineers shall be employed at regular wages; also board furnished or regular compensation for same allowed.

It is also understood that all work that can be prepared for the shop shall be so prepared during the period of laying up

THE MARINE REVIEW

and that all such work after being returned from the shop shall be assembled and placed so as to perform the duty and functions of a steam engine or its auxiliaries by the regularly appointed complement of engineers during the period of fitting out.

TRANSPORTATION.

For steamers trading not further east than Buffalo the following conditions shall obtain in regard to transportation: All engineers will be furnished first-class transportation, including berth and meals, from the lake port nearest their home to their steamers when going to fit out, and after the steamer goes out of commission, first-class transportation, including berth and meals, shall be furnished to the lake port nearest the homes of the engineers, providing, in either of the above cases that the engineer does not live further east than Buffalo and not further west than Chicago or Duluth.

For steamers trading east of Buffalo the following conditions shall obtain in regard to transportation: First-class fare shall be furnished engineers when going to fit out steamers moored east of Buffalo, from Buffalo to any port east of Buffalo, and when the boat goes out of commission first-class transportation shall be furnished to engineers from any point to the lake port nearest the home of the engineer, not further west than Chicago or Duluth.

BOARD AND MAINTENANCE.

After January 1 and until such time as the boat goes into commission engineers who are engaged at laying up or fitting out a steamer in a port where said engineers reside, board or compensation for same shall not be required, but in all other cases board shall be furnished, or regular compensation for same allowed.

In all cases where proper maintenance is not furnished aboard the steamer a flat rate of one dollar (\$1.00) per day shall be allowed to all engineers.

No engineer will be required to sleep on board a steamer fitting out and laying up until rooms are properly fitted out and steam heated.

This schedule does not apply to certain car-ferry steamers, passenger steamers and miscellaneous steamers where special agreements have been entered into.

ETRURIA-STONE DECISION.

In the case of the Etruria-Amasa Stone collision in Lake Huron, June 18, 1905, Judge Swan in the United States Court in Detroit has held that both steamers were equally to blame. The Etruria was sunk in collision. The Hawgood Transportation Co., owners of the Etruria, sued Pickands, Mather & Co., owners of the Amasa Stone, for \$283,000 damages.

ENGINEERS OF PITTSBURG CO.'S BOATS.

Mr. F. B. Smith, chief engineer of the Pittsburg Steamship Co.'s fleet, has announced the appointment of engineers as follows: It will be observed that E. S. Stoddard, H. C. McLeod, A. L. Eggert and E. H. Learned get the new 600-footers:

Steamer.	Engineer.	Captain.
Baker	E. S. Stoddard	W. C. Butts.
Bessemer	A. G. Haig	R. J. Walder.
Black	John Hegemer	M. H. Clark.
Briton	William Cleas	W. G. Rogers.
Bunsen	Frank Mansfield	W. F. DeLaney.
Cambria	L. O. Wilcox	Ed Mooney.
Colt	H. T. McLeod	Stanton Markle.
Colgate	Joseph Hasler	Duncan Buie.
Coralia	A. P. Williams	J. B. Lyons.
Corey	M. Toner	John Smith.
Cornell	G. C. Lawrence	Pierre Bouille.
Corona	J. H. Regin	F. A. Dupue.
Corsica	William Hasler	W. H. Landgraf.
Cort	C. L. Birstrand	Charles Caughnall.
Crescent City	E. J. Fitzgerald	Nelson Brown.
Eads	R. W. Hunter	Frank Ott.
Edenborn	S. H. Hunter	M. J. Madden.
Ellwood	Levi Walder	James Buchanon.
Empire City	F. J. Spencer	Ben Ogden.
Eriesson	J. W. Parr	Fred Hasenflue.
Fairbairn	Thomas Treleaven	E. S. Ellis.
Frick	S. W. Armstrong	C. C. Stewart.
Fulton	George Arnold	John Dunn.
Gary	John Dupont	B. McGregor.
Gates	James Inman	Gus Atkinson.
German	William D. Killett	A. D. Vorce.
Gilbert	W. G. Tilton	H. Bennett.
Griffin	L. L. Hineline	Paul Gutch.
Harvard	William Denison	Frank Bertrand.
Hill	H. F. Schmidt	A. W. Holmes.
Houghton	Alexander McKenzie	W. H. Stern.
Joliet	J. A. Bennett	George Dupue.
La Salle	H. P. Roberts	Richard Call.
Linn	Herman Dupont	Andrew Cowie.
Lynch	H. L. Eggert	Tacoma.
McDougall	H. E. McIntosh	John Lohr.
Malietoa	J. B. McDermid	Hugh McCann.
Manoa	James Duncan	E. S. Ellis.
Maricopa	J. H. McTilien	W. M. Bostwick.
Marina	A. D. Birdsall	Grafton McDonald.
Marina	H. W. Firby	W. S. Richie.
Mariposa	Neil McNeil	J. F. Mackin.
Mariska	Richard Mastin	Colonial.
Maritana	B. Cassidy	Arnold Evenson.
Maruba	A. J. Armon	D. C. Whitney.
Masaba	J. M. Conroy	L. Miskin.
Mataafa	Gus Johnson	Hiawatha.
Mather	R. B. Huston	T. J. Moran.
Matao	Frank Schwartz	Massachusetts.
Mauna Loa	D. Fraser	D. B. Elsey.
Morgan	C. A. Fletcher	Merriamac.
Morse	Henry Annett	Captain.
Murphy	William Bourlier	S. Minskey.
Neilson	E. R. Leedham	Twin Sisters.
Palmer	F. A. Smith	A. J. Monroe.
Perkins	E. H. Learned	Antrim.
Phipps	Fred Warning	F. E. Johnson.
Poe	A. Jackson	Tyrene.
Princeton	W. A. Marshall	
Queen City	F. L. Smith	
Ream	M. B. Sturtevant	
Rensselaer	W. H. Phillips	
Rockefeller	L. W. McEachren	
Rogers	William Dornbrook	
Roman	George H. Barth	
Saxon	E. J. Rae	
Shaw	Duncan McViear	
Siemens	I. F. Walsh	
Stephenson	William P. Diamond	
Trevor	F. C. Yeager	
Van Hise	John Skelly	
Watt	A. W. Armon	
Wawatam	M. F. Sweeney	
Widener	E. W. Fox	
Wolvin	James Hyde	
Zenith City	S. D. Graham	

GILCHRIST MASTERS.

Capt. J. L. Weeks, marine superintendent of the Gilchrist Transportation Co., has announced his appointments of masters as follows:

Steamer.	Captain.
Cen. Garretson	C. T. Gunderson
H. P. McIntosh	W. G. Stewart
I. B. Wood	F. L. Ennes
John Sherwin	F. A. Goodell
F. J. Hecker	J. C. Byers
G. H. Russel	Charles Hahn
F. W. Gilchrist	Charles Hinslea
J. L. Weeks	Peter Full
P. G. Walker	Ben Mosher
F. C. Gilchrist	A. M. Shepard
R. E. Schuck	C. L. Gudeback
R. L. Ireland	J. P. Minskey
H. S. Sill	Alex Clark
L. Woodruff	Thomas Gibson

The White Star Line of Detroit, recently purchased the American Blower Co.'s apparatus for ventilating the dynamo room on the steamer *Tashmoo* and the boiler room on the *Greyhound*.

LAKE SHIP YARD METHODS OF STEEL SHIP CONSTRUCTION.

BY ROBERT CURR.
RIVETING.

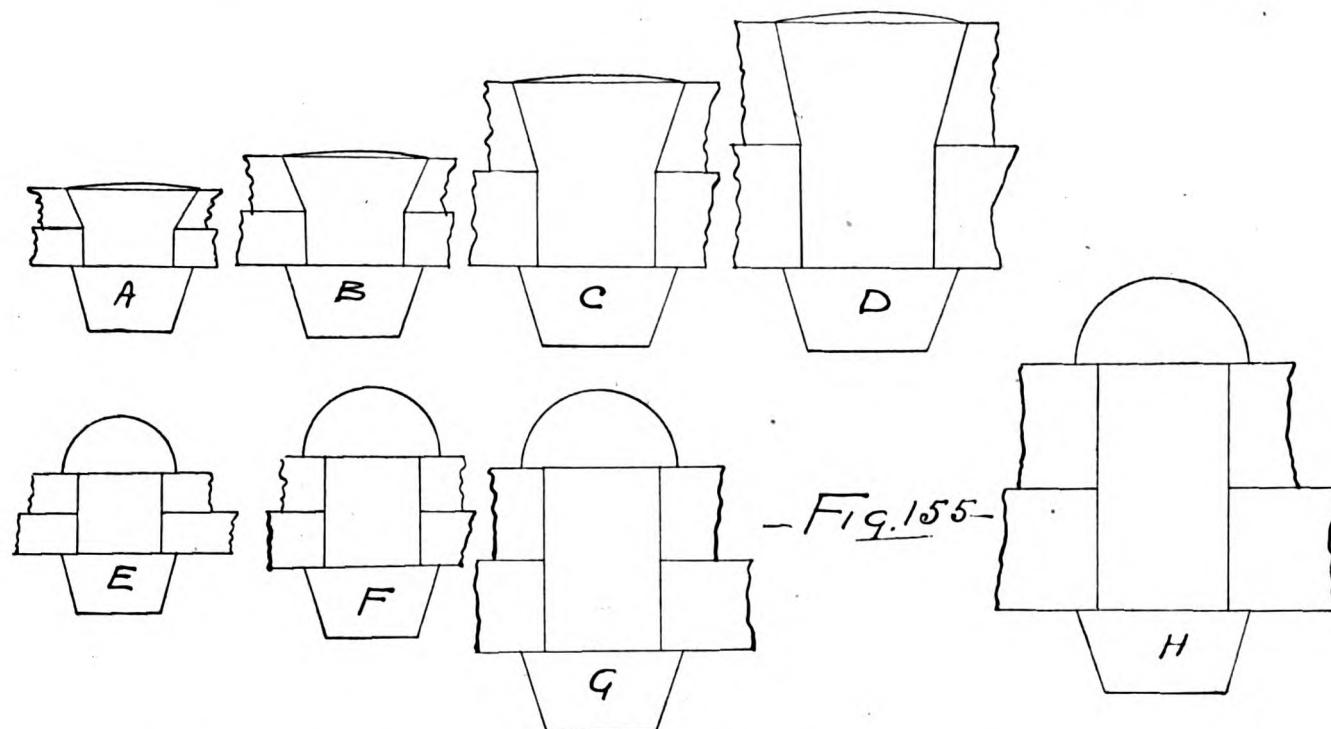
As explained in the previous article all the work is bolted up and the holes examined prior to the riveters

shown by sketches and termed full rivets.

E, F, G and H show the pan head and snap point which is used everywhere clear of the parts that have to be flush. Table I shows the diameters, and length of rivets for hand work for two thicknesses of plates;

stem and stem posts five diameters. With these exceptions all watertight work has a pitch of rivets of $4\frac{1}{2}$ diameters and the balance seven to eight diameters.

The riveting in Scotland including bolting up is done 40 per cent cheaper by hand than in this country.



starting work. Pneumatic tools are the principle ones in use on this work and as the rivets are a quarter of an inch longer for the same work over the hand work goes to show in itself the superiority over hand riveting.

Fig. 155 shows the style of rivets used and formed throughout on lake-built vessels.

A, B, C and D show $\frac{5}{8}$, $\frac{3}{4}$, $\frac{7}{8}$ inches

for each thickness of plates over two, $\frac{1}{8}$ of an inch must be added to the length of an additional $\frac{1}{4}$ of an inch for machine riveting.

The width of butt straps and laps are also shown on this table.

Table II shows the number of rivets in laps between the frames.

The pitch of rivets run for lapped and strapped butt connections $3\frac{1}{2}$ di-

The pneumatic riveting can be done 30 per cent cheaper on the great lakes than hand work so that the hand work including the bolting up in Scotland can be done 10 per cent cheaper than the pneumatic riveting and by adding 20 per cent for bolting up shows in favor of the Scotch hand riveting 30 per cent over the machine riveting on the great lakes.

The riveting prices in Scotland are listed in book form and cover 300 items. The riveting price list even takes up cases of rivets coming in way of heels of angles what is termed bad laying out of the fitters. The mold system of work prevents any of this kind of work and the regular pitch of rivets and nice line of same is clearly shown throughout on a vessel built on molds.

Fifty items covers all the prices on lake-built vessels in the riveting because there is nothing covered up in a way to make it awkward for the riveters to get at the work.

The keel plates, liners and straps, keel angles, center keelson plates and top angles are erected and riveted before the frames are put up.

The frames are all riveted on the ground including the center keelson vertical angles and beams the only ex-

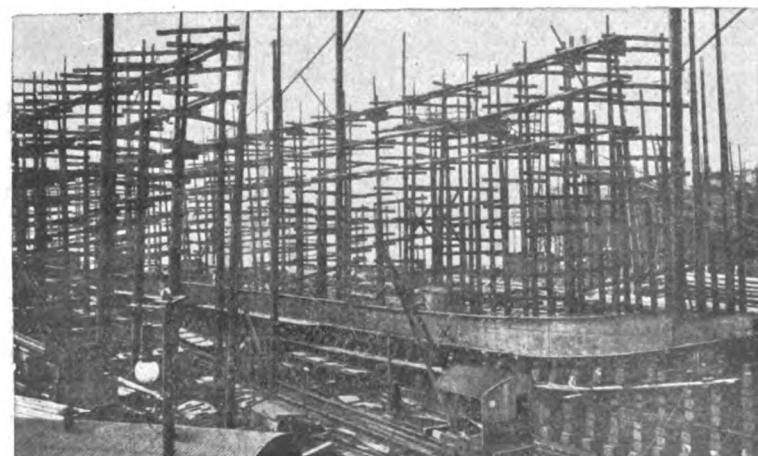


FIG. 156.

and one inch diameter rivets with the countersunk points and pan heads, the points are left slightly concave as

ameters, watertight work on center keelson five diameters watertight bulkheads three shell six diameters and

ception being at the side stringers one clip is left until the intercostals are in place which are put in as soon as

gotten between the beams. The collision bulkhead is also riveted with all the parts and erected in place com-

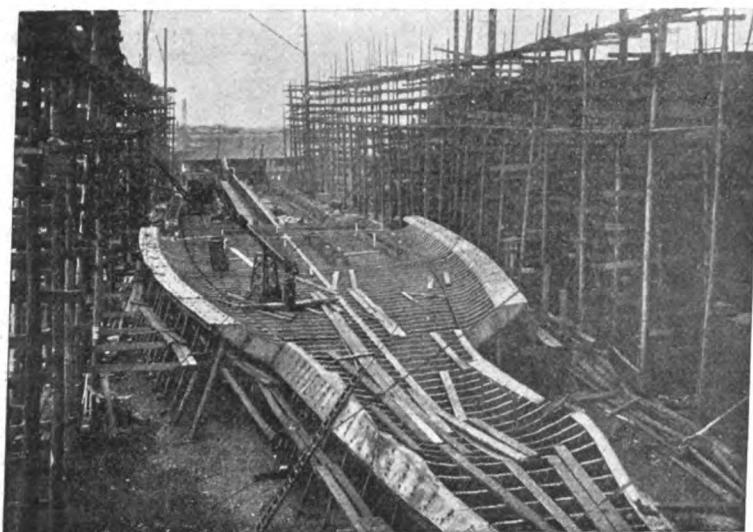


FIG. 157.

the frame is hoisted. The belt frames are also riveted up on the ground from the keel to the main deck, only one of the clips at the stringers and the lap which comes on the tank top angle are left unriveted until the belt frames are erected. The seam connecting the belt frame at side to the bottom is left until the work has been examined and proven fair on the top sides. The arch plate the top of the belt frame is also riveted on the ground including the deck plate between the hatches and all connections on same the frame rivets and one of the clips for the continuous channels are all that are left to be riveted in place.

At the ends the frames with all the component parts are riveted on the ground and when erected the frame is

spar deck follows up after the frames are erected and riveted up before any of the stringers are put on which leaves no odd work whatever to do when the decks are completed. The girders and intercostals in the bottom follow up as soon as the frames are erected and this work is all cleaned up including the shell plating before the tank top plating is put on. This work follows up so closely that the tank top is on and riveted within 12 ft. of the girders and shell plating and as the ballast piping is shipped along with the girder plates there is no delay for the tank top on that account and all the work is thoroughly cleaned up in the tanks before being covered in and very little cleaning out of the tank is necessary with this arrangement.

On the sides of the vessel all the work is also cleaned up before the shell or tank at side is put on thus

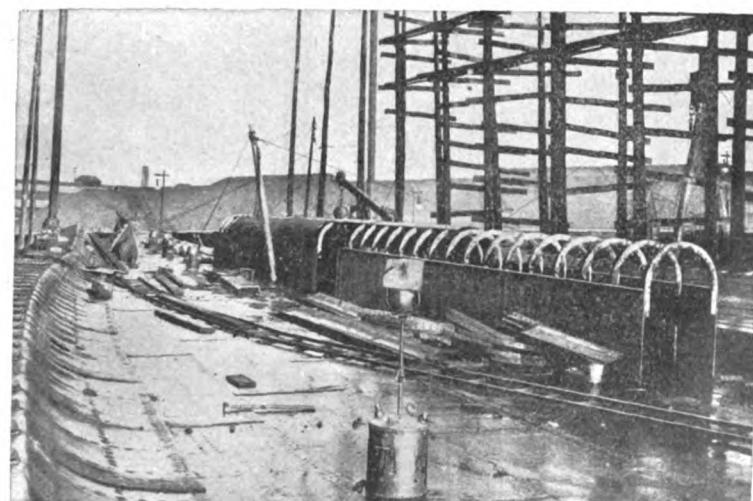


FIG. 159.

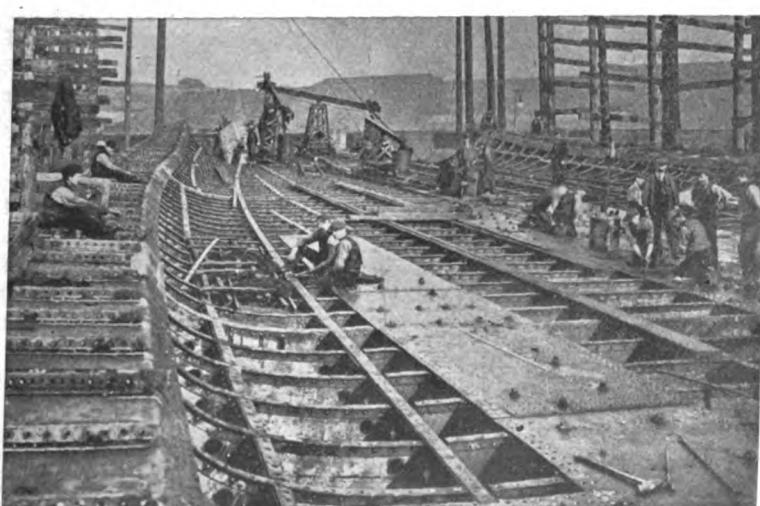


FIG. 158.

placed in place complete. The side stringers and breast hooks are riveted together in a way so that they can be

plete so that very little is left to rivet when the peaks have the material in place. All the skeleton work on the

cleaning up all the inside work before covering same up.

The shell hand riveting costs in Scotland including bolting up for $\frac{5}{8}$ diameter \$1.74, $\frac{3}{4}$ diameter \$1.98, $\frac{7}{8}$ diameter \$2.22 and one-inch diameter rivets \$2.70 per hundred.

The inside work runs about three per cent less for the straight away work.

On the great lakes \$2.50 is paid for $\frac{5}{8}$ diameter, \$3.00 for three-fourths, \$4.00 for seven-eighths and \$5.00 for inch rivets without any bolting up.

The inside work runs the same for flush work by hand. All machine work is 30 per cent less than hand work not including bolting up.

CALKING.

Calking on the great lakes is all done by pneumatic tools and is finished for one-third the price of hand work.

The hand work in Scotland would cost for calking overlapped work on shell 10 cents and edge and edge 12

The water is pumped up until there is a steam from the drilled hole in the air pipe. The stream of water runs

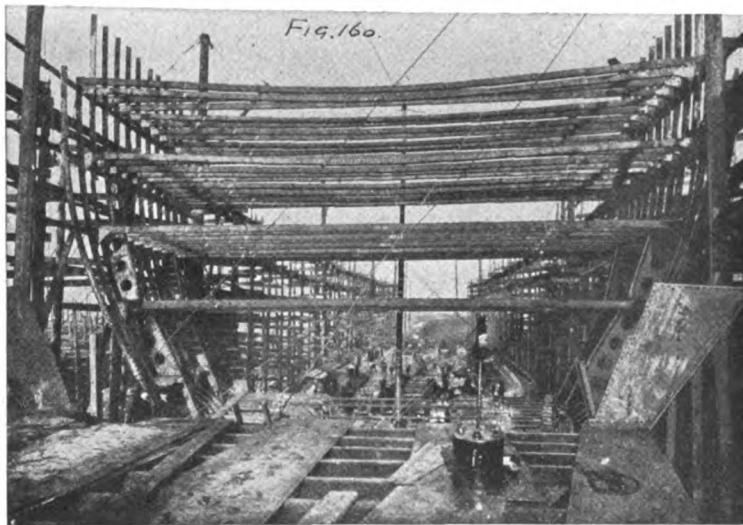


FIG. 160.

cents per yard, tank top $7\frac{1}{2}$ cents and decks $6\frac{1}{2}$ cents per yard, on the great lakes the cost would be the same.

Calking by machine on the lakes costs three cents and edge and edge work six cents per yard. Chipping costs in Scotland five cents per foot for each one-eighth in thickness and by machine on the great lakes costs half of the same.

The chipping and calking by hand on the great lakes are the same as in Scotland but the machine calking is one-third only and the chipping one-half of the cost of hand work.

TANK TESTING.

The center keelson and divisions at the ends of the tanks are made watertight and come under a pressure of about eight pounds per square foot.

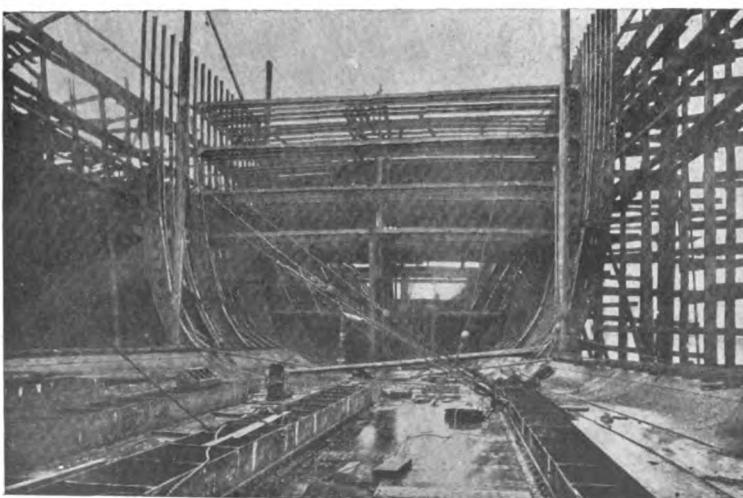


FIG. 161.

The air pipes are used for the head and a hole is drilled in same about 16 feet above the tank or any height specified.

into a pan or is run over to the side of the vessel not under test. This pressure is held until the center keelson, divisions and tank top are care-

fully examined after which the tank is passed as O. K.

In Scotland a pan is usually fastened to the top of pipe and water is run in until it is filled to top, the water is expected to remain in the pan during the examination of the divisions and tank top. The same precautions are taken on the great lakes as in Scotland in looking out for stoppers, etc.

The cost of doing this work on the great lakes runs about the same as in Scotland.

Sweden will be represented at the naval review in Hampton Roads on the occasion of the opening of the Jamestown exposition, by the new armored cruiser *Fylgia* of 4,600 tons. It will be the cruiser's maiden voyage. It is probable that she will be commanded by Capt. Lindberg, chief of the Stockholm naval station, and

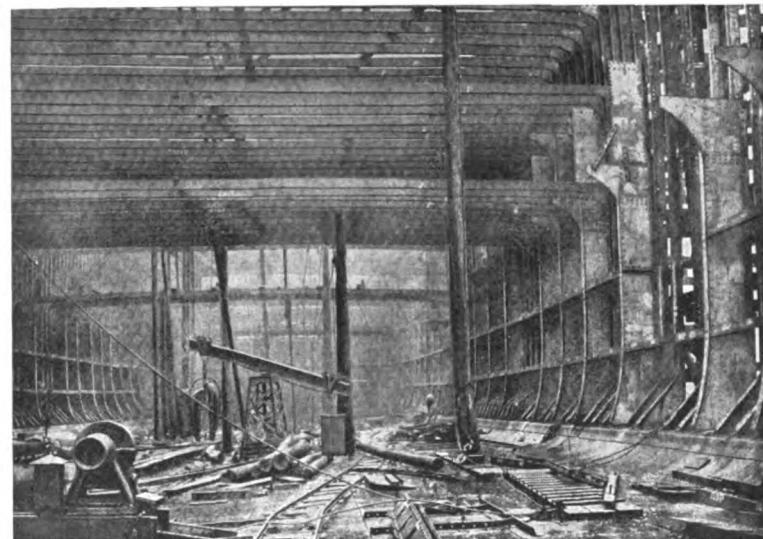


FIG. 162.

among her officers will be Prince William, second son of Crown Prince Gustave. There will be sixty naval cadets aboard as well as a commission sent to study conditions in this country.

The new state canal board of New York at its first meeting sanctioned the request of State Engineer Skene for the withdrawal of the plans submitted by State Engineer Van Alstyne, of the proposed barge canal work, which plans called for an expenditure of between \$9,000,000 and \$10,000,000. This was done in order that State Engineer Skene might examine the plans before the board took action upon them.

The Hamburg-American and Hamburg-South American companies are reported to have decided upon inaugurating a combined steamship service between New York and Brazil.

SCIENTIFIC LAKE NAVIGATION

By Clarence E. Long

SIMPLE DEFINITIONS.

The true course of a ship is the angle which a ship's track makes with a true meridian. Any course measured from a true meridian is always a true course (or bearing).

The correct magnetic course is the

angle (N and S on the card), and represents the effect of disturbing forces of iron near it.

The true course steered is the angle contained by the meridian and the direction of the ship's keel.

The correct magnetic course steered

The following diagrams will explain this graphically.

WHAT EACH ONE IS.

Now, bear in mind what a true course or bearing is; what a correct magnetic course or bearing is; how the correct magnetic course or bearing is obtained from the true course or bearing; and that the difference between a true course or bearing and a correct magnetic course or bearing is the variation; that a compass course or bearing is the course or bearing affected by both variation and deviation, or a true course or bearing affected by both variation and deviation, and lastly, that a compass course or bearing is the correct magnetic course or bearing corrected for deviation, and that the difference between a correct magnetic course or bearing and a compass course or bearing is the deviation.

As we are already aware the deviation is one of the corrections in deducing the correct magnetic course or bearing to the compass course or bearing.

HOW THE COMPASS COURSE IS OBTAINED.

The correct magnetic course corrected for deviation gives the compass course, the same as when the variation is allowed to the true course to obtain the correct magnetic course; or, the variation applied to the true course gives the correct magnetic course, and the deviation applied to the correct magnetic course gives the compass course.

A correct magnetic course means that the variation has been applied to the true course, and similarly, a compass course means that the deviation has been applied to the correct magnetic course; or the variation and deviation applied to the true course; or the course is affected by the variation and deviation.

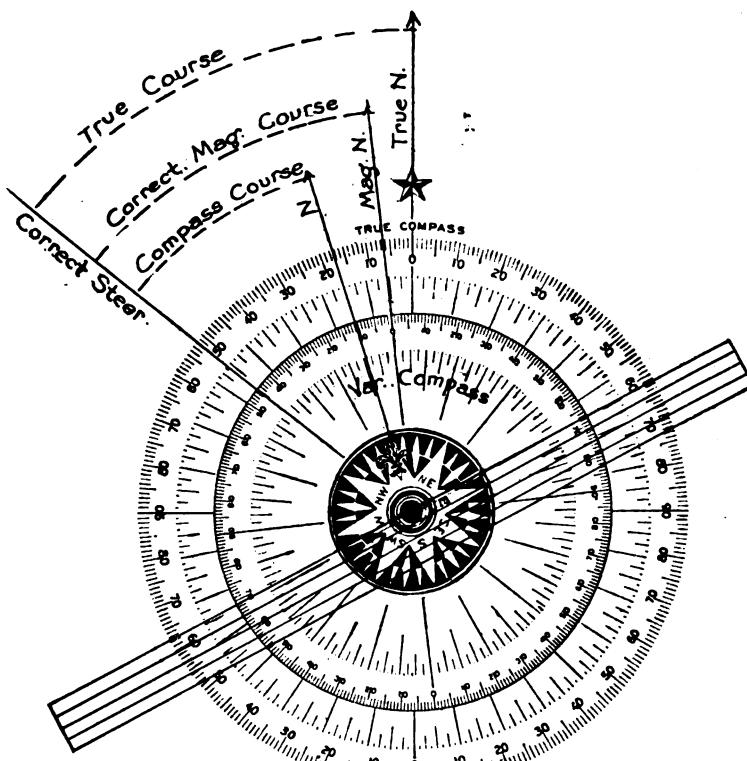
The deviation of the compass is named easterly or westerly, as in the case of the variation (but unlike the variation, it differs on every point) and the rule for applying it to the correct magnetic course to obtain the compass course, is also similar, hence:

To find the compass course the correct magnetic course and deviation being given. Rule—

Allow easterly deviation to the LEFT of the correct magnetic course to obtain the compass course.

Allow westerly deviation to the RIGHT of the correct magnetic course to obtain the compass course.

Note.—The same rules should be ob-



Showing True Course, Correct Magnetic Course and Compass Course. The Var. and Dev. are both Wly. in this case. To steer any true course in this case the course by compass corresponding to the true course will be found to the right of the true course.

The Var. above is $6\frac{1}{2}$ degrees Wly. and the Dev. about $11\frac{1}{2}$ degrees Wly. If it were desired to steer N 52 degrees W true, it would be necessary to move to the right from this course $6\frac{1}{2}$ degrees and $11\frac{1}{2}$ degrees, or 18 degrees, to allow for the existing Var. and Dev., which in this particular case amounts to the above amount.

To know which course to steer by compass to make good any true course (according to the Var. and Dev. in the above case) lay ruler or straight-edge from the center of the compass to the desired true course on the outer circle. The Var. circle will give you at once the correct magnetic course and the inner circle the compass course corresponding to the true course. The ruler in the above diagram will explain this. The true course is S $62\frac{1}{2}$ degrees W. (Var. $6\frac{1}{2}$ degrees Wly.) and the correct magnetic course S 79 degrees W according to Var. circle, or where the ruler coincides with it. The compass course shown by the same alignment of the ruler is about W by S.

angle which a ship's track makes with the magnetic meridian. Or it is the true course corrected for variation.

The compass course is the angle which a ship's track makes with the compass needle (N and S on the compass card). The compass course is the correct magnetic course corrected for deviation or the true course corrected for both variation and deviation.

The variation of the compass at any place is the angle between the meridian of the place and the magnetic meridian of the same place.

The deviation of the compass is the angle between the magnetic meridian and the direction of the compass needle.

is the angle contained by the magnetic meridian and the direction of the ship's keel.

The compass course steered is the angle contained by the direction of the compass needle and the direction of the ship's keel.

The course made good is the angle included between the meridian and the rhumb (straight) line passing through the place left, and the position arrived at. The course made good may be the true course made good, the correct magnetic course made good and the compass course made good, depending on the meridian from which it is measured.

served in applying the deviation to the correct magnetic course to obtain the compass course as were employed in applying the variation to the true course to obtain the correct magnetic course; also that the same system of notation should be adopted in numbering the points or degrees of the compass as calculated according to their position right or left of north and south.

Remember that two Ls or two Rs are to be added; an L and a R to be subtracted, in converting a correct magnetic course to a compass course.

Easterly deviation is subtracted in the NE and SW quadrants and added in the NW and SE quadrants; westerly deviation is added in the NE and SW quadrants and subtracted in the NW and SE quadrants.

o is either north or south, and 8 points or 90° , is either east or west. When the correction amounts to more than 8 points or 90° take it from 16 points or 180° , and change N to S, or S to N, and L to R, or R to L.

If the deviation being subtractive exceeds the amount from which it is to be taken take the points or degrees comprising the course from the deviation, or simply take the course from the deviation, and name it R if it had previously been L, but towards the L if it had been R.

A number of examples of each kind will explain this:

The correct magnetic course is NE, the deviation being $\frac{1}{2}$ point easterly, what is the compass course corresponding thereto?

Correct Mag. course NE = 4 pts. R of N
Dev. Ely. (sub) $\frac{1}{2}$ " L

Compass Course $3\frac{1}{2}$ " R of N
[= NE $\frac{1}{2}$ N

The correct magnetic course is S by E $\frac{3}{4}$ E, deviation $1\frac{1}{2}$ points westerly, what is the corresponding compass course?

Cor. Mag. Co. S by E $\frac{3}{4}$ E = $1\frac{3}{4}$ pts. L of S
Dev. Wly. (sub) $1\frac{1}{2}$ " R

Compass Course $\frac{1}{4}$ " L of S
[= S $\frac{1}{4}$ E

C. M. C. NNE = 2 pts. R of N
Dev. Ely. (—) 2 " L

Comp. Course o=North

Cor. Mag. Co. S by E = 1 pt. L of S
Dev. Wly. (—) 1 " R

Compass Course o=South
C. M. C. W by S = 7 pts. R of S
Dev. Wly. (+) 1 " R

Compass Course 8 " R of S = West
C. M. C. N $\frac{1}{4}$ E = $\frac{1}{4}$ pt. R of N
Dev. Ely. (—) $\frac{5}{8}$ pt. L

Compass Co. $\frac{3}{8}$ pt. L of N = N $\frac{3}{8}$ W

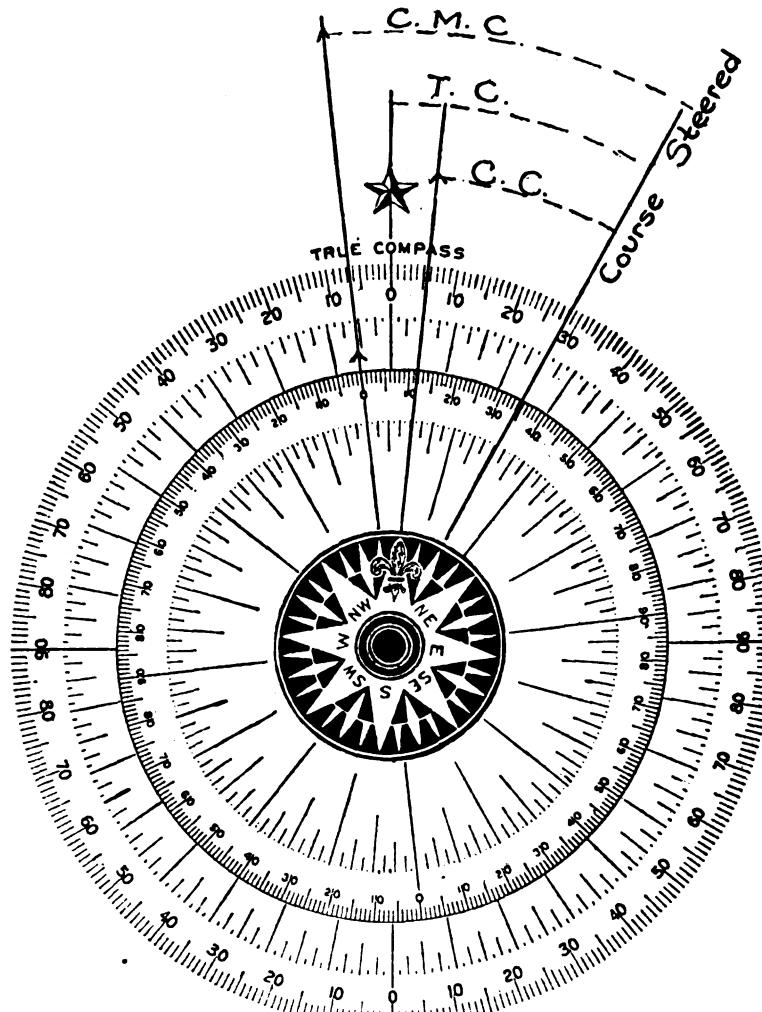
Here the deviation exceeds the amount of the course, and being subtractive the course is taken from the deviation and the course reckoned the other way, that is, to the left.

Cor. Mag. Co. ESE = 6 pts. L of S

degrees, turn the course into degrees if expressed in points, and proceed as follows:

The correct magnetic course is W by N, deviation 6° easterly, what is the compass course?

Cor. Mag. course W by N = 79° L of N
Dev. Ely. (+) 6° L



Supposing it was desired to make good a true course of N 28 degrees E, with a Var. of $6\frac{1}{2}$ degrees Wly. and a Dev. of 12 degrees Ely. What course must we steer by a compass having such deflections? Now, if we did not allow for the Var., but steered N 28 degrees E (suppose we had no deviation) we would be steering $6\frac{1}{2}$ degrees to the left of the place we were supposed to be heading for. Very well, if the Var. will carry the ship to the left we can counteract the effects beforehand by allowing it to the right of the true course we desire to steer. $6\frac{1}{2}$ degrees to the right of N 28 degrees E is N $34\frac{1}{2}$ degrees E, which is the correct magnetic course, and also the compass course if there were no Dev., but the above figure shows that the needle of the compass is deflected about 12 degrees to the right or Ely. of magnetic north owing to the magnetism of the ship, hence we must apply that to the left of our correct magnetic course to produce the compass course, since an Ely. deflection of the needle will carry the ship to the right of the course steered if not taken into account; therefore, we allow this Ely. deflection to the left, and 12 degrees to the left of N $34\frac{1}{2}$ degrees E is N $22\frac{1}{2}$ degrees E, or NNE, which represents the compass course to be steered in order to make good a true course of N 28 degrees E with $6\frac{1}{2}$ degrees Wly. Var. and 12 degrees Ely. Dev.

Imagine yourself standing in the center of the compass card looking over the point of the compass to be corrected or steered, and reason out why you allow the Var. and Dev. to the right or to the left, as the case may be. If you will do this you will be making your own rules, rules that will suggest themselves, and they will not need memorizing.

Dev. Ely. (+) 2 " L

Compass Course 8 " L of S = East

Cor. Mag. Co. E by N = 7 pts. R of N

Dev. Wly. (+) $2\frac{1}{4}$ " R

(exceeds 8 pts.) $9\frac{1}{4}$
16

Compass Course $6\frac{3}{4}$ pts. L of S =

[ESE $\frac{3}{4}$ E

When the deviation is expressed in

Compass Course 85° L of N =
[W $\frac{1}{2}$ N, nearly.

The correct magnetic course is S by E $\frac{3}{4}$ E, deviation 15° westerly, what is the compass course?

Cor. Mag. Co. S by E $\frac{3}{4}$ E = 20° L of S
Dev. Wly. (—) 15° R

Compass course 5° L of S
[= S $\frac{1}{2}$ E

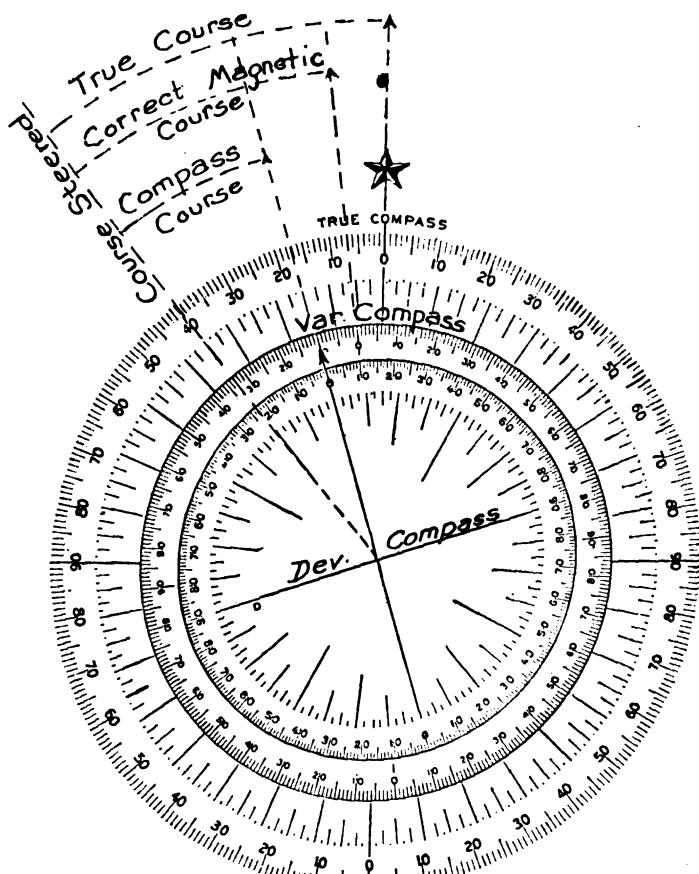
The correct magnetic course is N

87° W, deviation 14° easterly, what is the compass course?

Cor. Mag. Course 87° L of N
Dev. Ely (+) 14° L

(exceeds 90°) 101° L of N
180°

Compass Course 79° R of S=W by S
The correct magnetic course is S 8°



Showing true compass, Var. compass and Dev. compass. Var. is 6 degrees Wly. and Dev. 10 degrees Wly.

W Dev. 16° Ely.

Cor. Mag. Course 8° R of S
Dev. (-) 16° L

Compass course 8° L of T = S 3/4 E

Here the deviation exceeds the amount of the course, therefore, the course is subtracted from the Dev. and reckoned the other way, from south.

Correct the Course in the First Place.

Note.—The correct magnetic course or bearing, when possible, should be corrected for Dev. beforehand to obtain its compass course. First the Var. is applied to the true course to get the correct magnetic course, then the Dev. corresponding to this correct magnetic course must be found from the table of deviations, or the curve of deviations, belonging to that particular compass, and the amount, whatever it is, applied to the correct magnetic course to obtain the compass course,

which in reality is the true course first sought.

It is possible to do this in a steam-boat and a sailing vessel with a fair wind when running on a straight course. When the true course has been corrected for Var. and Dev. the result is the compass course and it is the course to be steered in order to make good

course; or the same way that the Var. is applied in converting a correct magnetic course to a true course, in fact there is the same relationship existing between these courses, they being first cousins.

For an example, we will suppose that a sailing vessel is put close to the wind; her compass says she is sailing NE, and she keeps on this course for an indefinite length of time, the Var. for the run being 6° Ely., and the Dev. on NE is 5° Ely., what is the true course the vessel has been making over the ground?

Compass Course NE = 40° R of N
Dev. Ely (+) 6° R

Cor. Mag. Course 51° R of N
Var. Ely. (+) 5° R

True Course 56° R of N = NE by E.

Here the Var. and Dev. are of the same name, both being Ely., making the total correction (Var. and Dev. combined) 11° Ely. Although the vessel has been steering NE by compass she has really been steering one point to the right of the course shown by compass, or NE by E.

If it were desired to steer a true NE course with the wind fair, under the same conditions, the vessel would have to steer NE by N, thus:

True Course NE.... = 45° R. of N
Var. Ely. = 5° L

Cor. Mag. Course.... 40° R of N
Dev. Ely. = 6° L

Compass Course 34° R of N = [NE by N (nearly.)

The compass course is S by E, and the Dev. on this course is 3/4 point Ely. What is the correct magnetic course? Compass course S by E... = 1 pt. L of S.

Deviation Ely. 3/4 pt. R
Correct Magnetic course.. 1/4 pt. L of S = S 3/4 E.

The compass course is E 1/2 S; deviation on this heading being 1 1/2 points Wly. What is the correct magnetic course?

Compass course.. E 1/2 S = 7 1/2 pts. L [of S.

Dev. Wly. 1 1/2 pts. L

Correct Magnetic course 9 pts. L [of S.

16

7 pts. R

[of N = E by N.

The compass course is N 1/2 E: Dev. 14° Wly. What is the corresponding correct magnetic course?

Compass course N 1/2 E = N 6° E

Dev. Wly. 14° Wly.
Correct Mag. course.. N 8° W = N $\frac{3}{4}$ W.

Here the Dev. exceeds the amount of the course, consequently the course is taken from the Dev.

The vessel is heading SSE by compass when the compass bearing of an object is SW $\frac{1}{2}$ W; the Dev. when the vessel heads SSE is $\frac{3}{4}$ pt. Ely., and the Var. in the locality of the vessel is 3° Wly.; what is the true bearing of the object?

Compass bearing SW $\frac{1}{2}$ W.. = $4\frac{1}{2}$ pts. R of S.

Dev. on SSE Ely..... $\frac{3}{4}$ pts. R or S.

Correct Magnetic bearing..... $5\frac{1}{4}$ pts. R of S.

Variation Wly. 3° = $\frac{1}{4}$ pts. L.

True Bearing 5 pts. R of S = SW by W

Dev. for Ship's Head and Not on Bearing.

Note.—Be careful about applying the deviation for the direction of the vessel's head, instead of the deviation for the direction of the bearing. Mistakes frequently occur to the beginner in regard to this matter. The deviation as you can readily see is due to the direction of the vessel's head and any bearing taken will be affected by the deviation for the ship's head at this time of bearing, therefore, the deviation on the point has nothing to do with the problem.

Total Correction.

If the variation and deviation are of like names add them together to obtain the total correction; if the variation and deviation are of different names subtract the less from the greater and give it the name of the greater—this will be the total correction. A few examples will illustrate the method:

The true course is N by W $\frac{1}{2}$ W, variation 6° Ely., deviation 5° Ely.; what is the compass course?

Var. Ely. + 6° being of like name
Dev. Ely. + 5° add them together.

Total Correction Ely. + 11° (left)
T C N by W $\frac{1}{2}$ W = 17° W

Compass course N 28° W =
[NNW $\frac{1}{2}$ W.

By the Plus and Minus Signs.

Note.—It is convenient to speak of Ely. variation and deviation as plus (+), and of Wly. variation and deviation as minus (—). This manner of distinguishing the name of the Var. and Dev. by the plus and minus signs, though purely arbitrary, is convenient when one has become accustomed to it. Thus, in the example just given,

we have N 17° W for the true course with $+ 6^\circ$ of variation and $+ 5^\circ$ of deviation: since as algebraists are aware, these two quantities act in unison, and are therefore to be added, and as Ely. variation and deviation are allowed to the left, or added in the NW quadrant, we add the total correction to the true course. The tyro must guard against the mistake of using the plus and minus signs in their arithmetical sense, since in the process just described, both signs are plus and happen to be additive to the true course, but only because it happened to be in the NW quadrant, where Ely. variation and deviation are always additive from true course to compass course; had it been the reverse operation—compass course to true course then the total correction would be subtracted; or, if the true course were N 17° E, instead of west, the total correction would be subtracted. Remember that these signs have nothing to do with adding or subtracting, only in ascertaining the total correction; plus means Ely. and minus Wly., both in variation and deviation.

To give a case where the variation and deviation (or vice versa) have contrary signs, and consequently neutralize each other: let the true course be south with $- 8^\circ$ variation, and the deviation $+ 8^\circ$, the compass course would still be south, the same as the true course:

Var. $- 8^\circ$
Dev. $+ 8^\circ$
—

Total Correction 0

Note.—If the variation and deviation have contrary names subtract them, and the total correction will have the same name as the greater.

As a further illustration let the true course be N 40° E, variation $- 10^\circ$, and the deviation $+ 6^\circ$. Then, taking their difference (being of contrary names) we have $- 4^\circ$ as the remainder; or in other words, the total correction is 4° Wly., which makes the compass course:

Var. $- 10^\circ$ Being of con-
trary names
Dev. $+ 6^\circ$ take their dif-
ference.

Total Corr. $- 4^\circ$ Apply to R.
True Course N 40° E

Compass C. N 44° E

Note.—If the variation had been $- 6^\circ$ and the deviation $+ 10^\circ$, the total correction would have been $+ 4^\circ$, or 4° Ely., applied to the left of the true course.

Rules for applying the variation and

deviation together to convert a compass course to a true course: Ely. variation and deviation allow to the right; Wly. variation and deviation allow to the left. The remainder of the work is identical with converting a true course to a compass course. A few examples will make this plain:

The compass course is N 44° E, Var. $- 10^\circ$; Dev. $+ 6^\circ$; what is the true course corresponding thereto?

Var. $- 10^\circ$
Dev. $+ 6^\circ$
—

Total Corr. $- 4^\circ$ (Wly. allow to
[the left.)

Compass C... N 44° E

True Course.. N 40° E

The compass course is N 28° W, Var. 7° , Dev. $+ 8^\circ$, what is the true course?

Var. $+ 7^\circ$ Being of like
[names add.
Dev. $+ 8^\circ$
—

Total Corr. $+ 15^\circ$ Apply to R being
[Ely.

Compass C... N 28° W

True Course... N 13° W = N by W $\frac{1}{2}$
[W nearly.

Here the total correction being Ely. is subtracted from the compass course because it is applied to the right.

Applying the variation and deviation together, or the total correction, by the R and L method:

The true course is E $\frac{1}{2}$ N, Var. $\frac{3}{4}$ -pt. Ely., Dev. $\frac{1}{4}$ pt. Wly., what is the compass course?

Var. Ely. $\frac{3}{4}$ pt. L. Unlike in
Dev. Wly. $\frac{1}{4}$ pt. R. name sub-
Dev. Wly. $\frac{1}{4}$ pt. R. [name
— [subtract.

Total Correction $\frac{1}{2}$ pt. L
True C E $\frac{1}{2}$ N = $7\frac{1}{2}$ pt. R of N.

Compass course.. 7 pt. R of N = E
[by N

The true course is SSW, Var. $\frac{3}{8}$ -pt. Wly., Dev. $\frac{7}{8}$ -pt. Ely., what is the compass course?

Var. Wly. $\frac{3}{8}$ pt. L.
Dev. Ely. $\frac{7}{8}$ pt. L.
—

Total correction... $\frac{1}{2}$ pt. L
True course SSW = 2 pt. R of S.

Compass Course... $1\frac{1}{2}$ pt. R. of S. =
[S by W $\frac{1}{2}$ W.

The true course is WNW, Var. $\frac{1}{4}$ -pt. Ely., Dev. $1\frac{1}{4}$ pt. Ely., what is the compass course?

Var. Ely. $\frac{1}{4}$ pt. L.
Dev. Ely. $1\frac{1}{4}$ pt. L.
—

Total correction $1\frac{1}{2}$ pt. L
True course WNW = 6 pt. L. of N.

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Compass course $7\frac{1}{2}$ pt. L. of N.
Compass course $1\frac{1}{2}$ pt. L. of N. =

The true course is SE by E, Var. $5\frac{1}{2}$ pt. Ely., no Dev., what is the compass course?

True course SE by E = 5 pts. L. of S.
Var. Ely. $\frac{5}{8}$ pts. L.

Correct Mag. course $5\frac{5}{8}$ L. of S.
No deviation 0

Compass course $5\frac{5}{8}$ L. of S. =
[SE by E $5\frac{1}{2}$ E.

Here the correct magnetic course is also the compass course because there is no deviation.

The true course is NNE $\frac{1}{2}$ E., no Var., Dev. $\frac{3}{4}$ Wly., what is the compass course?

True course NNE $\frac{1}{2}$ E. = $2\frac{7}{8}$ pts. R.
No Var. 0

Correct Mag. course $2\frac{7}{8}$ pt. R. of N.
[of N.

Dev. Wly. $\frac{3}{4}$ pt. R.
—
 $3\frac{5}{8}$ pts. of R. of
[N = NE $\frac{3}{4}$ N.

Here the true course is also the correct magnetic course because there is no variation.

When Deviations are Large.

Note.—Where deviations are large and are for ship's head by compass instead of ship's head correct magnetic the application of the deviation corresponding to the correct magnetic course will only give an approximation of the compass course, and it is necessary to take the deviation corresponding to the approximate compass course and apply it to the correct magnetic course to obtain the compass course desired. Where deviations are very large it may be necessary to make several approximations before obtaining the desired compass course. Just what this means is fully explained further on.

Note.—In converting a true course to a compass course the variation should first be applied to the true course to get the correct magnetic course, then the deviation corresponding to this correct magnetic course to get the compass course.

In converting a compass course to a true course under the same conditions the deviation should first be applied to the compass course to get the correct magnetic course, then the variation applied to get the true course. Bear this in mind.

The compass course is NW by W, Dev. $\frac{5}{8}$ pt. Wly., Var. $1\frac{1}{2}$ pts. Ely., what is the true course?

Dev. Wly. $\frac{5}{8}$ pt. L.
Var. Ely. $1\frac{1}{2}$ pt. R.
Total Correction $\frac{7}{8}$ pt. R.
Comp. C NW by W = 5 pt. L. of N.
True Course $4\frac{1}{8}$ pt. L. of N.
[= NW $\frac{1}{2}$ W.

The compass bearing of a lighthouse is W by N, when the vessel heads N by E $\frac{1}{2}$ E., Dev. $\frac{3}{8}$ pt. Ely. on this course; Var. 10° Wly., what is the true bearing?

Below is the example worked in degrees:

Compass bearing W by N = N 79° W.
Dev. $\frac{3}{8}$ pt. Ely. = $+ 4^\circ$

Dev. + 4°
Var. - 10°
—

Total correction - 6°
Compass bearing W by N = N 79° W
—

True bearing N 85° W
[= W $\frac{1}{2}$ N.

Here is the same example worked in points:

Dev. Ely. + $\frac{3}{8}$
Var. Wly. 10° = - $\frac{3}{8}$
—

Total correction - $\frac{1}{2}$
Com. bearing W by N = 7 pts. L.
[of N.

True bearing $7\frac{1}{2}$ pts. L.
[of N = W $\frac{1}{2}$ N.

Note.—In the conversion of courses the student may use any of the foregoing methods of correction, whichever appeals and comes the easiest to him. It is a good idea to adopt and preserve one common method or working system throughout and keep religiously to it. If the learner has a thorough understanding of the principles involved in the correction or conversion of courses, any one of the above systems will be easily and readily understood by him. If he has carefully gone through the preceding examples he cannot help but see it.

Some writers combining Var. and Dev. call it "total error" instead of "total correction." For the reasons already given Var. and Dev. cannot be called errors, unless incorrectly determined, but when accurately found they are nothing more than corrections. It is to be regretted, however, that these same writers define total [error] corrections as the angle between the north and south line of the compass and the astronomical or true north and south line; for this definition conveys an altogether wrong idea of what the compass ought to do. Dev. and Var. arise from entirely different causes and should never be mixed up with each other in this way. It is possible, by

compensation, to free the compass from the one, but not from the other.

It is well for the navigator to know that he is to starboard for Ely. Var. and Dev. in correcting a true course to a compass course, and to port for Wly. Var. and Dev. under the same circumstances. Ely. Dev. carries the ship to the right if not allowed for, and Wly. Dev. to the left if not allowed for. To correct a compass course to a true course port for Ely. Var. and Dev. and starboard for Wly. Var. and Dev.

Do not get the idea that it is always on east and west that the deviation is greatest and least on north and south. It all depends on the magnetism of the ship and the magnetism of the equipment, such as the boilers, engines, steam steerer, etc., etc.

Examples for Practice.

The true course is NNE $\frac{1}{2}$ S., Var. $\frac{1}{2}$ pt. Wly., Dev. $1\frac{1}{4}$ pts. Ely., what is the compass course? Ans. N by E $\frac{1}{2}$ E.

The true course is S by E, Var. 5° Ely., Dev. $\frac{1}{2}$ of a point Wly., what is the compass course? Ans. S $\frac{1}{2}$ E.

The true course is N by W $\frac{1}{2}$ W Var. $\frac{3}{4}$ pt. Wly., Dev. 15° Ely., what is the compass course? Ans. NNW $\frac{1}{2}$ W.

The true course is W $\frac{1}{2}$ N., Var. $\frac{3}{4}$ pt. Ely., Dev. $\frac{1}{2}$ Ely., what is the compass course? Ans. W $\frac{3}{4}$ S.

The true course is south Var. 17° Ely., Dev. 14° Wly., what is the compass course? Ans. S 3° E.

The true course is E $\frac{3}{4}$ S., Var. 42° Ely., Dev. 30° Wly., what is the compass course? Ans. N 86° E.

The true course is WNW, Var. 2 pts. Wly., Dev. $\frac{3}{8}$ pt. Ely., what is the compass course? Ans. NW $\frac{1}{2}$ W.

The true course SW $\frac{1}{2}$ S., Var. $\frac{1}{2}$ pt. Ely., Dev. $\frac{5}{8}$ pt. Wly., what is the compass course? Ans. SW $\frac{3}{8}$ S.

The true course is N $\frac{1}{2}$ W., Var. $\frac{1}{4}$ pt. Wly., Dev. $\frac{1}{4}$ Wly., what is the compass course? Ans. North

QUESTIONS FOR WHEELSMEN AND WATCHMEN.—NO. 30.

303. How would you pilot a boat from Lilly Pond to Lake Superior?

304. If you were running back before a northeast gale on Lake Superior with the intention of coming to an anchor under Oak Isle, explain which, in your judgment, would be the safest way to do it.

305. Having Duluth Ranges over stern of your boat, your steering compass reads NExE $\frac{1}{2}$ E, how would you steer with same compass and boat in same trim from Duluth so as to pass two miles off Devil Island?

306. With Superior Ranges over stern of your boat, your steering compass reads ENE, how would you steer with same compass and boat in same trim

from Superior so as to pass two miles off Devil Island?

307. Bound up Lake Superior and steering NNW and your boat running a mile every 5 min. and 43 sec. At 8:15 a. m. Manitou Island light bears west; at 9:15 a. m. it bears SW. How far from the lighthouse are you when second bearing is taken?

308. After you had taken second bearing and found what distance you were from the light, how would you steer so as to be about two miles off when abreast of the light?

309. At 4 p. m. you turn White Fish Point bound up Lake Superior, speed of boat about 12 miles an hour, course WxN $\frac{1}{2}$ N; 10 hours later you sight Manitou Island light dead ahead. How would you steer from the time you first sighted the light until you were abreast of it so as to bring you 2 $\frac{1}{2}$ miles off?

310. At 2:30 p. m. Sand Island light bears 1 point for'd of beam; at 2:35 p. m. it bears abeam. How far are you off the light when second bearing is taken, putting speed of your boat at 12 miles per hour?

311. At 2:30 a. m. Sand Beach light bears 1 point off the port bow; at 2:50 a. m. it bears 2 points off port bow. How far are you from light when second bearing is taken, and how far should you be off the light when it bears abeam by keeping the same course and speed of your boat being 12 miles an hour?

312. At 4 a. m. Thunder Bay Island light bears 2 points off port bow; at 4:30 a. m. it bears 4 points off same bow. How far from light should you be when second bearing is taken, and how far should you be off the light when abreast, providing you keep same course, speed of your boat being 10 miles an hour?

313. At 3:20 a. m. you sight Presque Isle light 3 points off port bow; your boat is running a mile every 4 min. 37 sec., and at 3:50 a. m. it bears 2 points for'd of beam. How far are you from light when second bearing is taken, and how far should you be off when abreast, provided you had not shifted your course any?

314. At 4 p. m. you sight a point of land bearing 4 points off starboard bow, and at 6 p. m. it bears abeam, speed of your boat is one mile every 7 min. 30 sec. How far are you off the point of land when second bearing is taken?

QUESTIONS FOR MASTERS AND MATES.—NO. 29.

430. Define the terrestrial equator.
431. Define the celestial equator.
432. What are the poles of the earth?
433. Which is the greater in length, the polar or equatorial diameters?
434. What is meant by the earth's orbit?
435. What is meant by the ecliptic?

436. What is the difference between the earth's orbit and the ecliptic?

437. What is meant by the equinoxes?

438. What is the inclination of the earth's axis to the perpendicular?

439. What is the difference between the earth's axis and the polar diameter of the earth?

440. What is latitude?

441. What is longitude?

442. What is a circle of declination?

443. What is celestial latitude?

444. What is meant by the equinoctial? What does it correspond to?

LEHIGH VALLEY COAL DOCK AT SOUTH CHICAGO.

The Lehigh Valley Coal Co. will replace its dock recently burned on Calumet river, South Chicago, with a most capacious and substantial structure. The storage building will be built of concrete walls set on pile foundations with steel superstructure, semi-circular at each end and with center row of steel and concrete columns supporting center line of truss members. The dimensions will be 524 ft. long, 260 ft. wide and 90 ft. high. Over this structure will be supported a portable bridge which will move the entire length of the building and will be equipped with conveyor system to deliver coal into stock. A series of underground tunnels equipped with conveyors will take the coal from the stock pile and deliver it to a mechanical screen system located in a separate building and known as the loading pocket and screen house, through which all coal must pass in preparation for the market. Every possible care has been taken to make this feature complete and this building will be 60 ft. by 60 ft. square by 100 ft. high. It will have a storage capacity for 2,000 tons of prepared coal and a daily working capacity of 4,000 tons and can be supplied either from cargo direct or storage.

Reloading will be handled with a mechanical box car loader having a capacity of 100 cars per day which may be largely increased by old hand methods from pockets, if desired. A car unloading system will be supplied, handling either box or open cars. The unloading feature will consist of five clam-shell hoists with working capacity of 180 tons each per hour discharging into conveyor system which operates in connection with either screen house or storage building. A scraper system supplying clam-shells in holds of boats will complete this system. It will be seen that the handling process will be entirely mechanical and far in advance

of any system now in operation. The power will be largely electric. The new work is well under way.

AIDS TO NAVIGATION.

Washington, Feb. 6.—Some very important provisions are contained in the house bill reported to the house this week for additional aids to navigation in the light house establishment on the great lakes. Besides the new light houses provided for in the house bill, it is expected that another one shall be added for Gull island off Ashland when the measure reaches the senate.

Those that are in the house bill include a light and fog signal at White Shoal, north end of Lake Michigan, to take the place of the light vessel now maintained there. The cost of this light house is not to exceed \$250,000.

A light and fog station at or near Split Rock near Beaver Dam is provided for at a cost not exceeding \$75,000.

Range lights at Grand Island harbor, Munising, Lake Superior, are to be maintained at a cost not to exceed \$15,000 and from and after the time when these range lights shall be put into service, the present Grand Island harbor lights shall be discontinued.

The Milwaukee light station on the point about one mile northward and eastward North point, northerly side of Milwaukee bay, and the light station at Macgulipin point, Mich., on the southerly side of the Straits of Mackinaw will be discontinued if this bill becomes a law.

CAPT. DONNELLY'S LECTURES.

Capt. Thomas Donnelly is delivering a series of marine lectures in the Old Collegiate Institute at Kingston, Ont. Capt. Donnelly delivered a similar series last year. It is noted that the attendance is very large. He emphasized the fact that eternal vigilance is the price of safety in lake navigation. The principal cause of disaster on the lakes consists of too implicit confidence in the compass and too much faith in the log, which is likely to fool navigators when being used in zero weather. If a lake navigator undertakes to navigate narrow passages in a snowstorm or fog, disaster is sure to follow. He added that accidents rarely happened with the engines running under check and the lead line in use. He thought that common sense ought to tell an officer to carry out this practice in thick weather.

The government of Newfoundland has contracted with English interests to establish a line of 22-knot trans-Atlantic steamers between St. John's and a port on the Irish coast. The colony is to subsidize the company to the extent of \$75,000 a year.